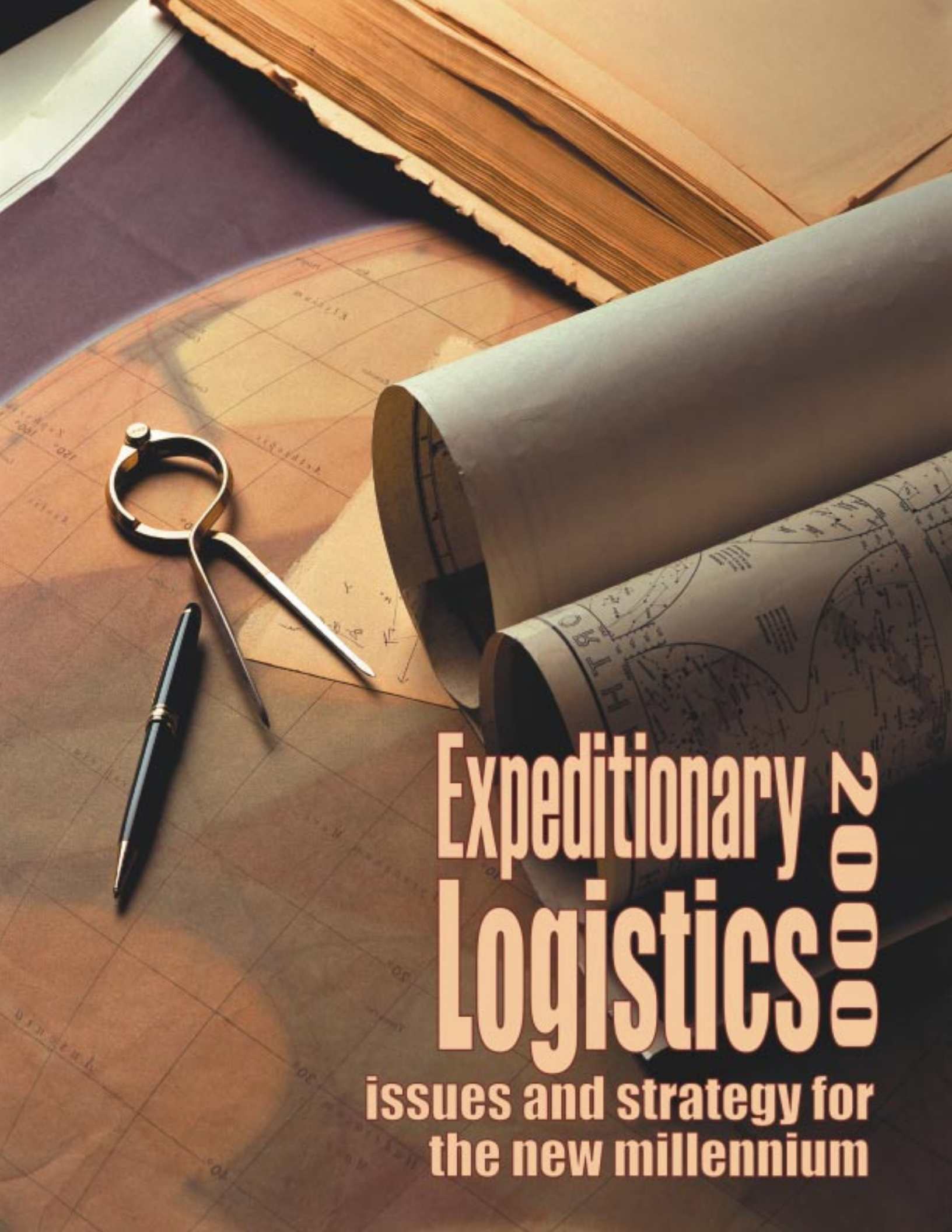
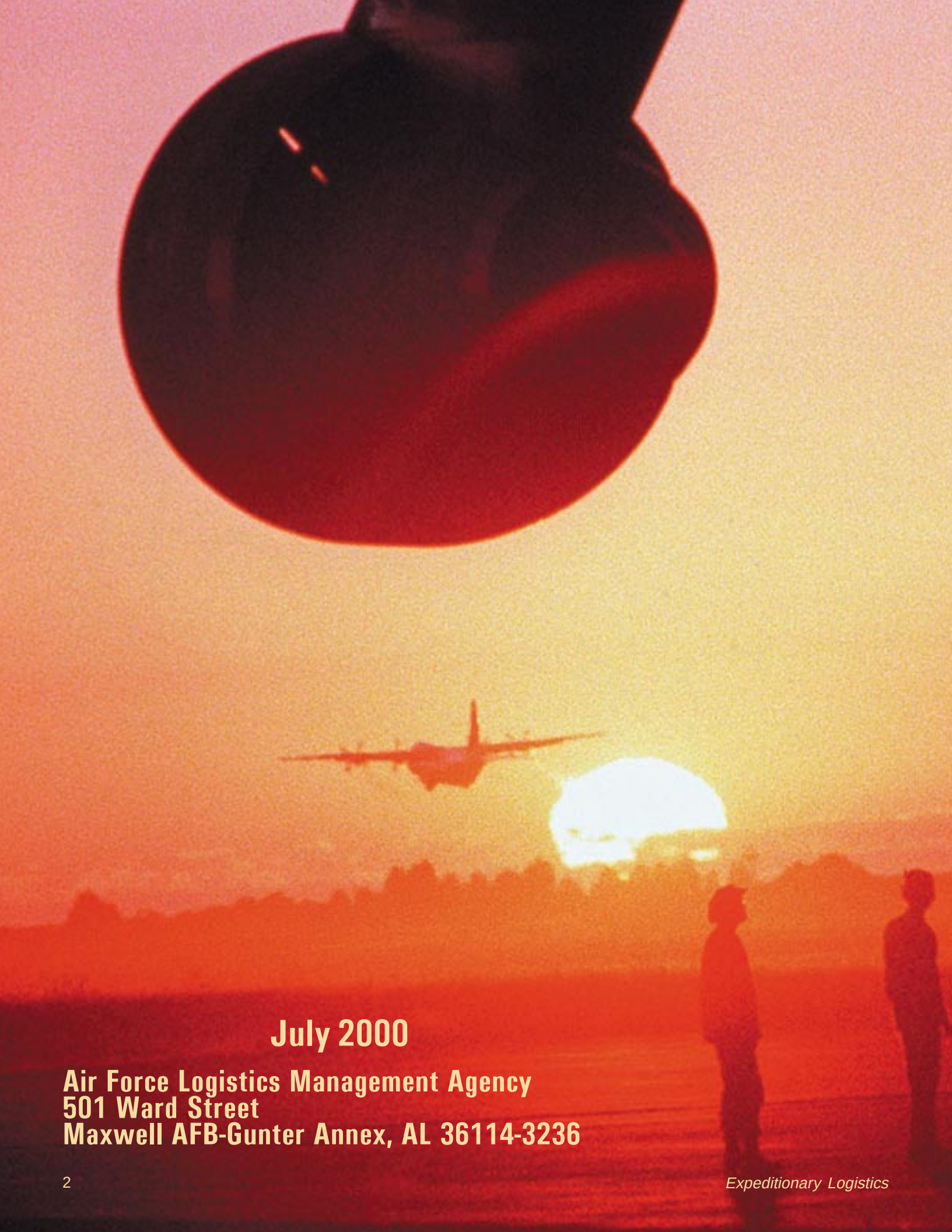


Expeditionary Logistics 2000

issues and strategy for the new millennium



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Expeditionary Logistics

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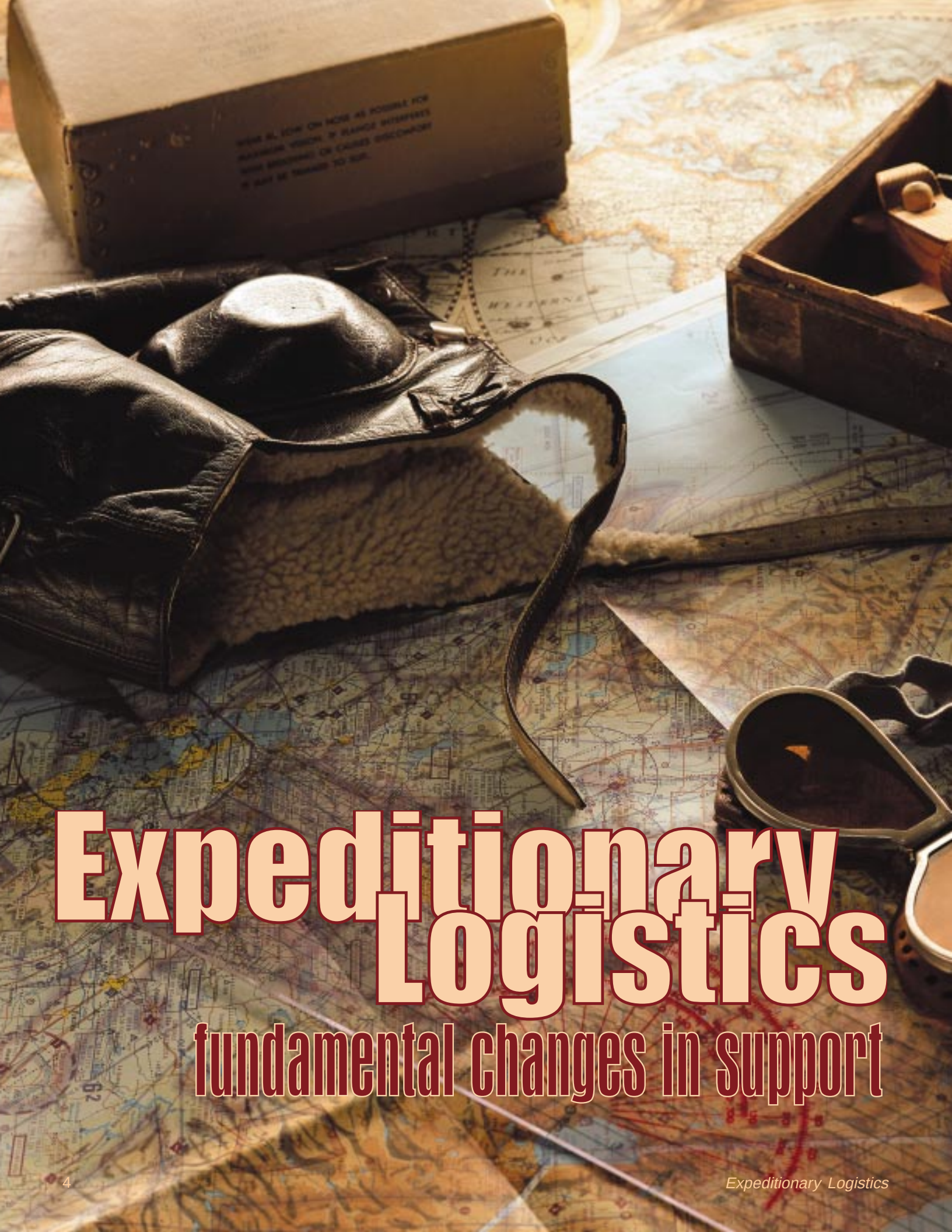

Expeditionary Logistics

fundamental changes in support

We need to continue the transition from a threat-based Cold War garrison force, focused on containment, to a capabilities-based expeditionary force focused on responsiveness.

General Michael Ryan, Chief of Staff, USAF

In a sense, the expeditionary use of airpower is not something new. In fact, one might argue that expeditionary airpower was present in the skies over Mexico in 1916, as the nascent air service chased Pancho Villa. Further, one could argue that airpower was expeditionary in each of the world wars and Korea as well. However, the force being molded today differs drastically from these historical predecessors. Rather than being reactive, airpower must now be proactive to meet the needs of a rapidly changing world. Today's definition of expeditionary airpower means a rapid response force that is light, lean, and tailored to mission needs. That being said, how does the Air Force become the expeditionary force we need today? What are the challenges, opportunities, and initiatives that need examination? And perhaps more important, how do existing logistics concepts and principles need to change to support expeditionary airpower. *Expeditionary Logistics: Issues and Strategy for the New Millennium* examines a number of these questions through a collection of selected readings.

The first section of readings focuses on Agile Combat Support (ACS) and how it must be organized and structured to support expeditionary airpower. These articles, developed as part of the RAND/Air Force Logistics Management Agency research partnership, assess the viability of several key ACS and expeditionary concepts. Two significant conclusions can be drawn from this body of work. First, several of the assumptions tied to the envisioned expeditionary structure must be reviewed. Second, and perhaps more significant, the concepts that govern warfighter support, as presently envisioned, must change.

The last section of the book deals with what today is a hotbed of discussion: contractors on the battlefield and outsourcing and privatization. Mr Pausch, Major Coggins, Colonel Michels, and Major Nelson examine these topics from a variety of points of view. Pausch warns against outsourcing certain support services, while Coggins suggests ways to better manage the competitive sourcing process. Michels asserts that contracting out can make sound financial sense, and Nelson argues that trusting weapon system support to contractors has the potential for significant trouble.

a global infrastructure to support EAF

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With the end of the Cold War, the United States has entered an entirely new security environment. It is now the only global superpower in a world of many regional powers. The subsequent demands for US military presence or intervention required the US Air Force to stage a large number of deployments—often on short notice and to far-flung locations—with a substantially smaller force than existed in the 1980s. The resulting increased workload and operational turbulence have been blamed for a decrease in retention and recent decreases in overall readiness.[1] In response to these concerns, the Air Force formulated a new concept of force organization, the Expeditionary Aerospace Force (EAF). Under this concept, the Air Force is divided into several Air Expeditionary Forces (AEF), each roughly equivalent in capability, among which

deployment responsibilities will be rotated.[2] Each AEF will have the capability to project highly capable and tailored force packages,[3] largely from the Continental United States (CONUS), on short notice to any point around the world. Rotating deployment responsibilities among units on an equitable and fairly predictable basis is expected to greatly decrease personnel turbulence.

The shift toward expeditionary operations presents numerous challenges, particularly in combat support. Here, we present analyses that indicate achieving the EAF goals with current support processes requires strategic preparation of a global support infrastructure: the development of a global system of forward locations, judiciously prepositioned materiel, and providing other types of logistics support such as maintenance and transportation.

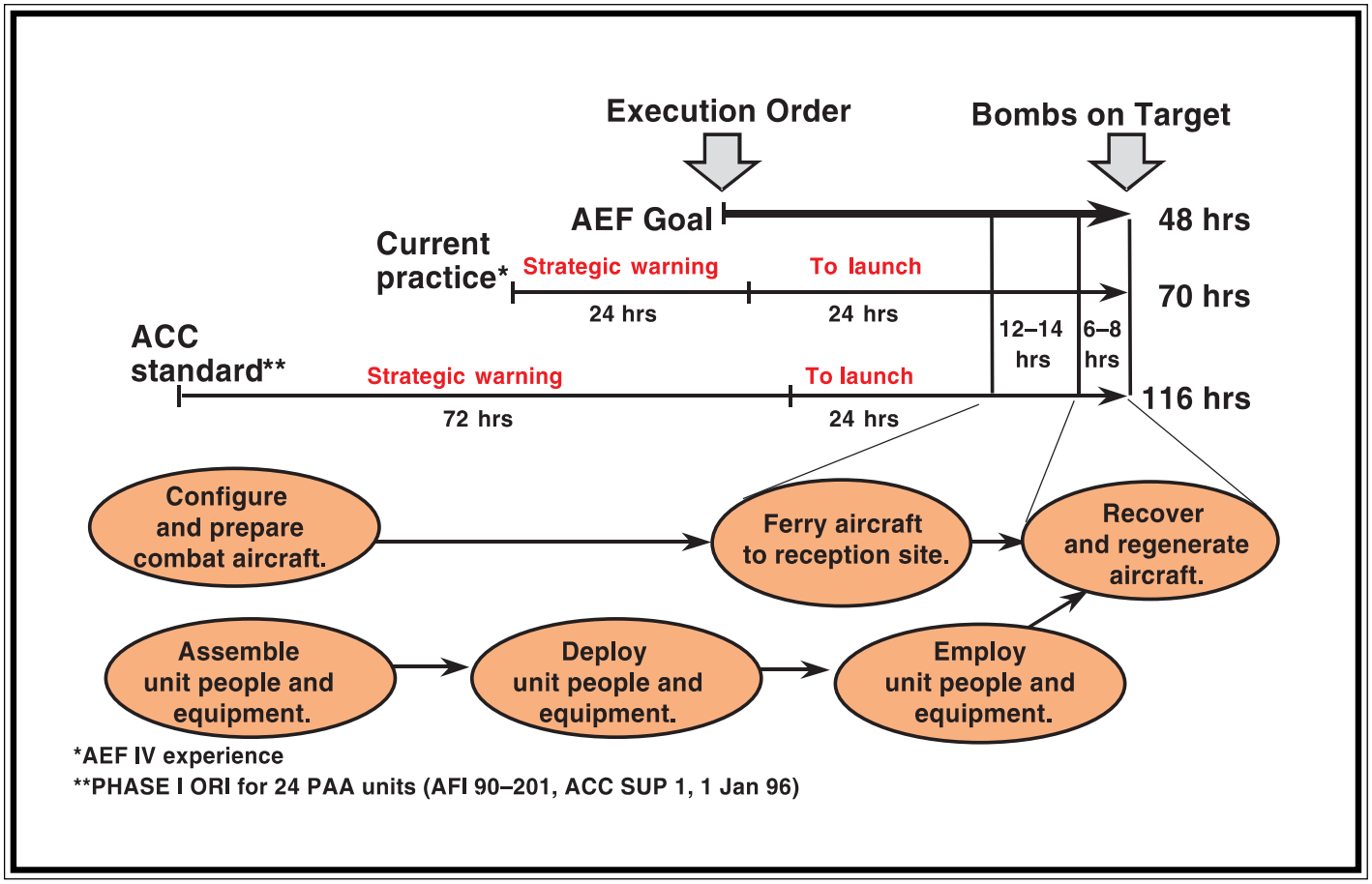

Figure 1. Deployment and Employment Planning

In the sections that follow, we analyze two key aspects of that global infrastructure: forward operating locations (FOL) and forward support locations (FSL).

Implementing the EAF: Agile Combat Support

A great deal of Air Force attention has been given to determining AEF composition and scheduling when each AEF will stand ready for its deployment commitment. With respect to deployment responsibilities, much of the Air Force effort concerning support focused on the deployment execution—how to compress time lines for deploying a unit's support functions, given current processes and equipment. Figure 1 illustrates the significant progress made by the Air Force in meeting the EAF's demands to deploy and employ quickly.

Rather than addressing deployment execution activities, we have concentrated on the *strategic* decisions that affect the design of the logistics infrastructure necessary to support rapid deployments. Figure 2 depicts the relationship of strategic decisions to the deployment and redeployment execution decisions illustrated in Figure 1. The large ovals below the readiness-to-reconstitution time line indicate areas of strategic decision making that need to be addressed. While many of these are topics of ongoing research by RAND, the Air Force Logistics Management Agency (AFLMA), and others, this article focuses on global infrastructure preparation.

Global Infrastructure Preparation

The original EAF concept envisioned air expeditionary wings (AEWs) deploying to any airfield around the world that had a runway capable of handling the operational and airlift aircraft, regardless of whether the airfield was a fully equipped military base or a *bare base* with minimal facilities. Reliance on prepositioned assets was to be minimized if not eliminated. Unfortunately, analyses show that at present prepositioned assets cannot be eliminated: the current logistics processes cannot support the timing requirements, and most equipment is too heavy to deploy rapidly. While new technologies and policies can improve this situation in the mid to long term, implementing the EAF over the next few years will require some judicious prepositioning at FOLs.

Global infrastructure preparation is, therefore, a central function of planning expeditionary support. Trade-offs among several competing objectives must be analyzed. These include time line, cost, deployment footprint,[4] risk, flexibility, and sortie generation. In our analyses, we determined the resources necessary to meet the operational employment objectives—time-phased sortie generation goals. Prepositioning everything at the base from which operations will be conducted minimizes the deployment airlift footprint and time line required to begin operations, but it also reduces flexibility, adds political and military risk, and incurs a substantial peacetime cost if several such bases must be prepared. Bringing support from the CONUS or a support location near the area of operation, whether in the

theater or outside the theater, increases flexibility and can reduce risk and peacetime cost for materiel. However, setting up support processes in this situation takes longer, and the deployment footprint is larger.

There are five basic components of the global infrastructure. These components are FOLs, FSLs, CONUS support locations (CSL), responsive resupply/transport system, and a logistics command and control (LOG C2) system.

FOLs are the locations from which aircraft conduct their operations or missions. FOLs are divided into three categories based on their infrastructure and our derived time lines:[5]

A **category-3** FOL is a *bare base*. It meets only the minimum requirements for operation (runway, fuel, and water) of a small fighter package. Such a base would take almost a week (144 hours) to prepare to support AEW high-sortie generation rates.

A **category-2** base has the same support facilities as a category-3 base plus prepared space for fuel storage facilities, a fuel distribution system, general-purpose vehicles (host nation support or for rent), and basic shelter. It may take up to 96 hours before a category-2 base could support AEW high-sortie generation rates.

A **category-1** base has all of the attributes of a category-2 base plus an aircraft arresting system and munitions buildup and storage sites already set up and 3 days' worth of prepositioned munitions. Such a base could be ready within 48 hours of the execution order to support high AEW sortie generation requirements.

Each category requires differing amounts of equipment to prepare the base for operations and, as a result, has a different time line and transportation requirement. As the third and fourth components of global infrastructure, two options were considered for supplying these resources: FSLs in or near the theater of operations and CSLs. An FSL can be a storage location for US war reserve materiel, a repair location for selected avionics or engine maintenance actions, a transportation hub, or a combination thereof. It could be staffed permanently by US military or host nation nationals or simply be a warehouse operation until activated. The exact capability of an FSL will be determined by the forces it will potentially support and by the risks and costs of positioning specific capabilities at its locations. The network of CSLs, FSLs, and FOLs needs to be coordinated to provide the resources necessary in order to meet operational goals.

The fourth and fifth components are assured resupply/transportation and a LOG C2 system to coordinate the delivery of resources to FOLs. If AEWs must deploy with minimum support and depend on resupply from either CSLs and/or a set of FSLs, they will need to have an assured resupply link whose responsiveness is aligned with the support that is available at the FOL. The strategic infrastructure envisioned here will also require a more sophisticated LOG C2 structure to coordinate support activities across FOLs, FSLs, and CSLs connected by a rapid transportation system. These last two components are the subject of current RAND and AFLMA research and are not treated further here.

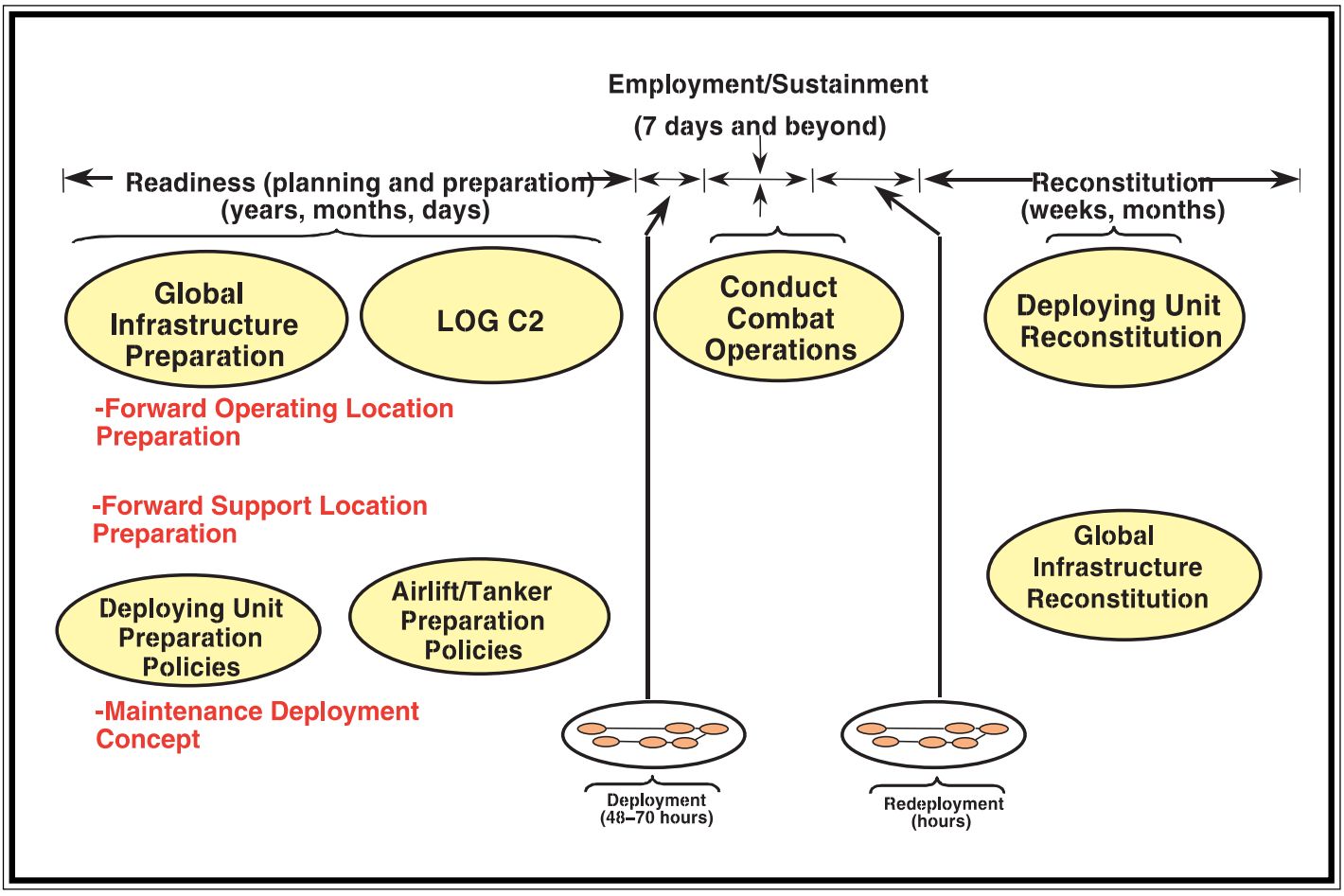

Figure 2. Strategic Decision Relationships

The global infrastructure, then, is a combination of FOLs, FSLs, and CSLs connected by assured resupply and monitored and controlled by a LOG C2 system. Our contribution in this article is to describe several tools and a prototype of the analysis and planning that the Air Force must do to prepare to deploy quickly under the EAF concept.

General Analytic Framework

To analyze basing structure decisions under extreme uncertainty, RAND and AFLMA developed logistics support models for five major resource categories and used them to assess how requirements change under different scenarios. These five categories—munitions, fuels support, unit maintenance equipment (the bulk of unit support equipment), vehicles, and shelter—make up the majority of support materiel for an air operation, as shown in Figure 3.[6] While these models focus on single commodities, they cut across organizational lines where necessary (for example, the munitions support model covers both munitions buildup and aircraft loading processes).

As Figure 4 illustrates, our models have three components. First is a mission requirements analysis that specifies the critical mission parameters determining each support commodity's requirements based on the mission to be flown. The second component is a set of employment-driven logistics process models to determine time lines to set up the process and the materiel, equipment, and people to establish and operate the process. These models are high-level models created within Excel spreadsheets.[7] The support options analysis evaluates the performance of alternative infrastructure options in providing these requirements (as an example, prepositioning all munitions at an FOL versus moving air-to-air missiles from the CONUS or an FSL). The results of the model analyses comprise recommendations for infrastructure location, forward or CONUS, as well as changes in policies and technologies. Note the feedback arrows in Figure 4 from both of the evaluations to the mission analysis. Part of the support planning process is to inform operational planners about support feasibility, costs, and risks. In some cases, operational plans might need to be adapted as well.

Expeditionary Deployment Performance

Our analytic method provides quantitative treatment of three key metrics: time line, deployment footprint, and cost. How well can FOLs with varying amounts of prepositioned equipment support expeditionary operations in terms of time line, footprint, and cost? What is the comparative performance of FSLs versus CSLs for supplying the materiel that is not prepositioned? Risk and flexibility are more difficult to quantify.[8] For now, decision makers must judge the quantitative trade-offs provided by the logistics modeling with the subjective factors of risk and flexibility.

We illustrate this analysis[9] with some results from a scenario requiring a mission package of 12 F-15Cs, 12 F-16CJs, and 12 F-15Es conducting ground attack operations with guided-bomb unit (GBU)-10s (2,000-pound bombs). Figure 5 displays the estimates made with the employment-driven models for six different configurations of FOLs, FSLs, or CSLs (each of three categories of FOL in combination with the two options for supplying the remainder).

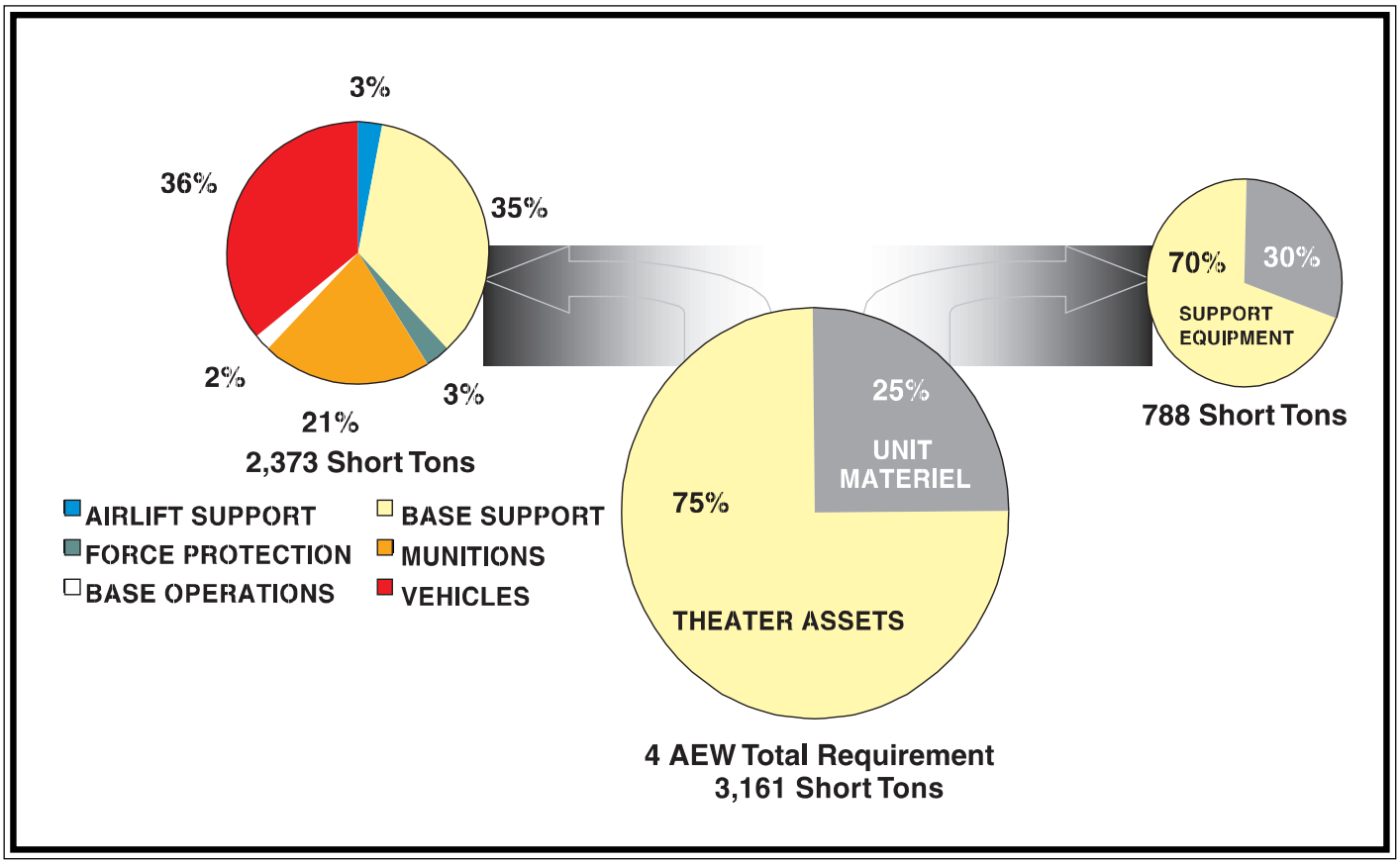

Figure 3. Support Materiel Requirements

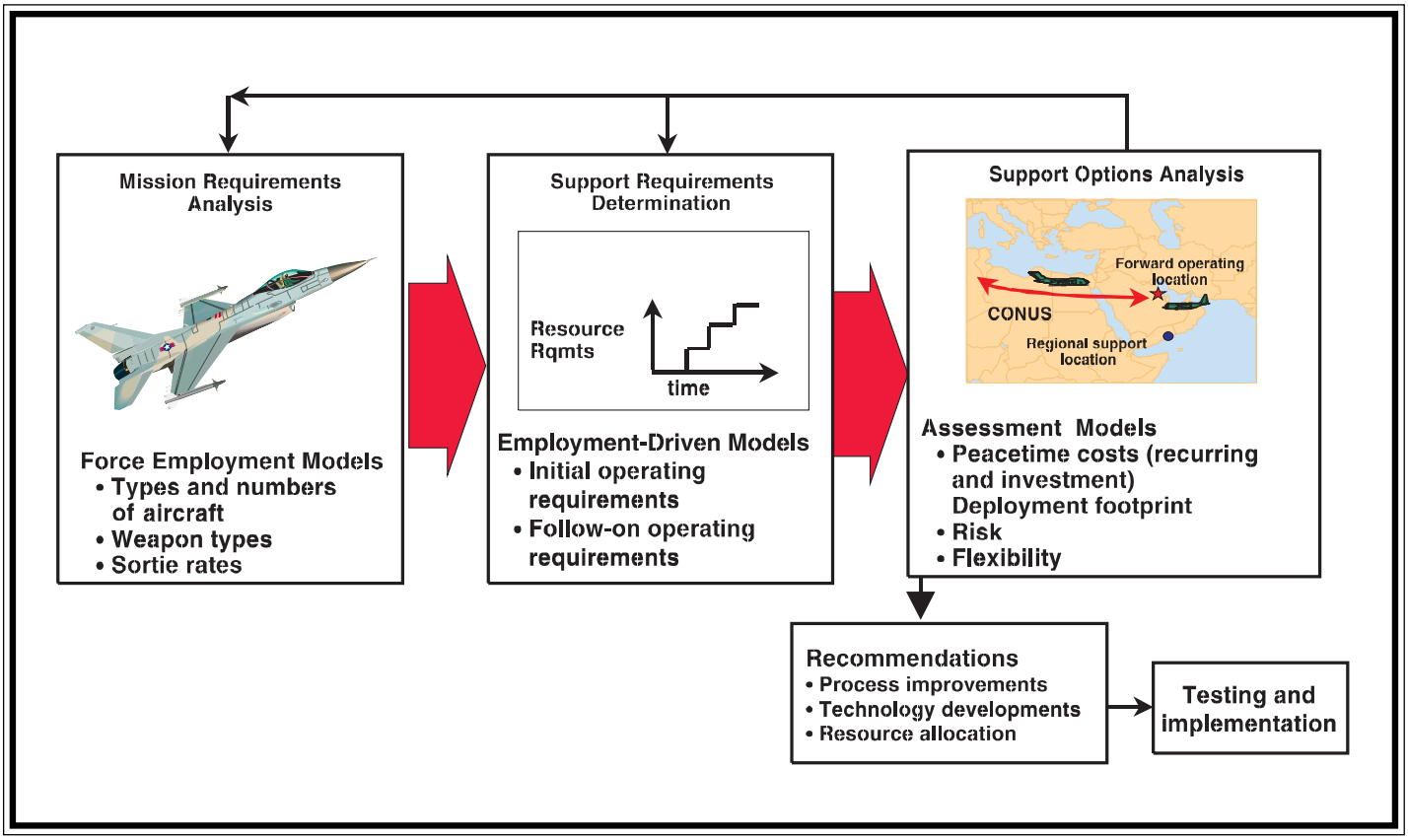

Figure 4. Model Components

Time lines to Deploy to Different Categories of FOL

The time line to have a given support capability up and running is the sum of times required to do a number of tasks (as an example, deploying people to theater, breaking out the deployed or stored equipment, and so forth). We get deterministic times for accomplishing tasks from either computations by the requirements models (for example, the time to build the first load of munitions) or from model rules that are based on judgment (for example, it takes 22 hours to deploy personnel from the CONUS to the FOL). Some activities can be done in parallel, and in these cases, the time required is the maximum of the longest individual process times. For example, equipment may be moved to an FOL from an FSL and unloaded while unit personnel are deploying. In this case, if the time to deploy the personnel were longer than the time to deploy the equipment and have it ready for use when the personnel arrive, the personnel deployment time would be used to determine the minimum spin-up time for this particular process. The models estimate *pessimistic* time lines by adding to a selected set of tasks a somewhat subjective increment.

We have integrated the time lines for the various commodities by adding the times required to unload the airlift (subject to the maximum-on-ground [MOG] constraint) and then taking the maximum of that time and all of the other times to set up the various commodity processes and produce the first sortie. This assumes an optimal integration of materiel arrival and process setup, and thus is a rough estimate of the optimistic initial operational capability (IOC). For the pessimistic IOC, we use a similar method on the individual pessimistic IOCs for each commodity and its unloading.

The results of the time line analysis for the three FOL categories are shown in the upper left-hand panel of Figure 5. The optimistic time to set up a category-1 base is just under 2 days, even though most equipment is prepositioned. The time is primarily driven by the time to deploy the people from CONUS and setup times for munitions and fuel storage facilities.[10] For the other options, time lines are driven by the MOG. The difference in time line between a CSL and an FSL is minimal because the bottleneck is in unloading.[11] For category-3 bases, unloading the bulky Harvest Falcon package[12] pushes up the time lines.

The bottom line is that meeting the 48-hour time line will be virtually impossible with current processes and equipment unless most equipment is prepositioned, and even then the time line is extremely tight.

Deployment Footprint

We define the deployment footprint as the amount of materiel that must be moved to the FOL in order for operations to commence. This is what we call the initial operating requirement (IOR). The upper right-hand panel of Figure 5 shows the initial footprint for the three categories of bases (the amount of airlift required to get the base operating).

Peacetime Cost Estimates

Current fiscal concerns require that the evaluation of options include the peacetime costs of setting up a given configuration of FOLs and FSLs (*investment*) and the peacetime costs of operating the system (*recurring*). Under our definition, a category-1 FOL will require prepositioning of the IOR of munitions (3 days); munitions assembly equipment; and

petroleum, oil, and lubricants (POL) storage and distribution equipment. The equipment then must be maintained for use and be activated for AEW exercises and/or use in a real conflict. If the munitions are to be stored at an FSL for transport to a category-2 FOL, the FSL must contain enough sets of equipment to cover several AEW operations in its area.[13]

The lower left-hand panel in Figure 5 compares investment costs for our scenario for four commodities.[14] The baseline configurations are two regions, five bases per region (any one of which might have to support the 36-aircraft AEW), and two simultaneous AEW operations (each central stock location, if any, must be prepared to support two AEWs).[15]

As expected, providing for five category-1 FOLs per region is very expensive, and munitions are by far the greatest cost even though minimum IOR (only 3 days' worth) of munitions are prepositioned at each base. Drawing materiel back from the FOLs decreases the cost, increases flexibility, and (may) decreases risk because each FSL only requires two sets of equipment. However, the deployment footprint increases in terms of the number of transport aircraft needed to move the munitions upon execution of an AEF deployment.

Recurring costs have two components: the transportation cost for exercising AEW deployments and the cost for storage operations. The lower right-hand panel of Figure 5 shows our estimates of the recurring costs for these four commodities for the base configurations. These recurring costs show a different pattern. The category-3 bases supported from the CONUS are very expensive to operate, primarily due to the large costs of transporting munitions and the Harvest Falcon sets twice a year for exercises.

Looking at Figure 5 as a whole, we can see that category-1 bases give the fastest response but at high investment costs. Category-2 bases have a longer response time but at less investment cost, and FOLs have higher investment costs than stockpiling in the CONUS but have lower recurring costs. While the deployment footprint is roughly equal for FSL and CSL options, the type of airlift differs. Tactical or intratheater airlift could be used to provide resources from FOLs, whereas strategic airlift would be needed to provide the resources from CSLs.

Effects of Different Technologies on Deployment Performance

We can use our modeling to assess the impact of different technologies and policies on support option decisions. We explored the replacement of GBU-10s with the small bomb system (SBS), a 250-pound bomb that is effective against 70 percent of targets for which GBU-10s are used. Because the SBS is much lighter than the GBU-10, each F-15E can carry more of the former.[16] Thus, it takes fewer sorties to deliver the same amount of ordnance. This will in turn reduce POL requirements and, with the right scheduling of sorties, refueler requirements. However, these savings must be weighed against the higher investment costs of using this more expensive munition.[17] Figure 6 captures the analysis of this alternative support option.

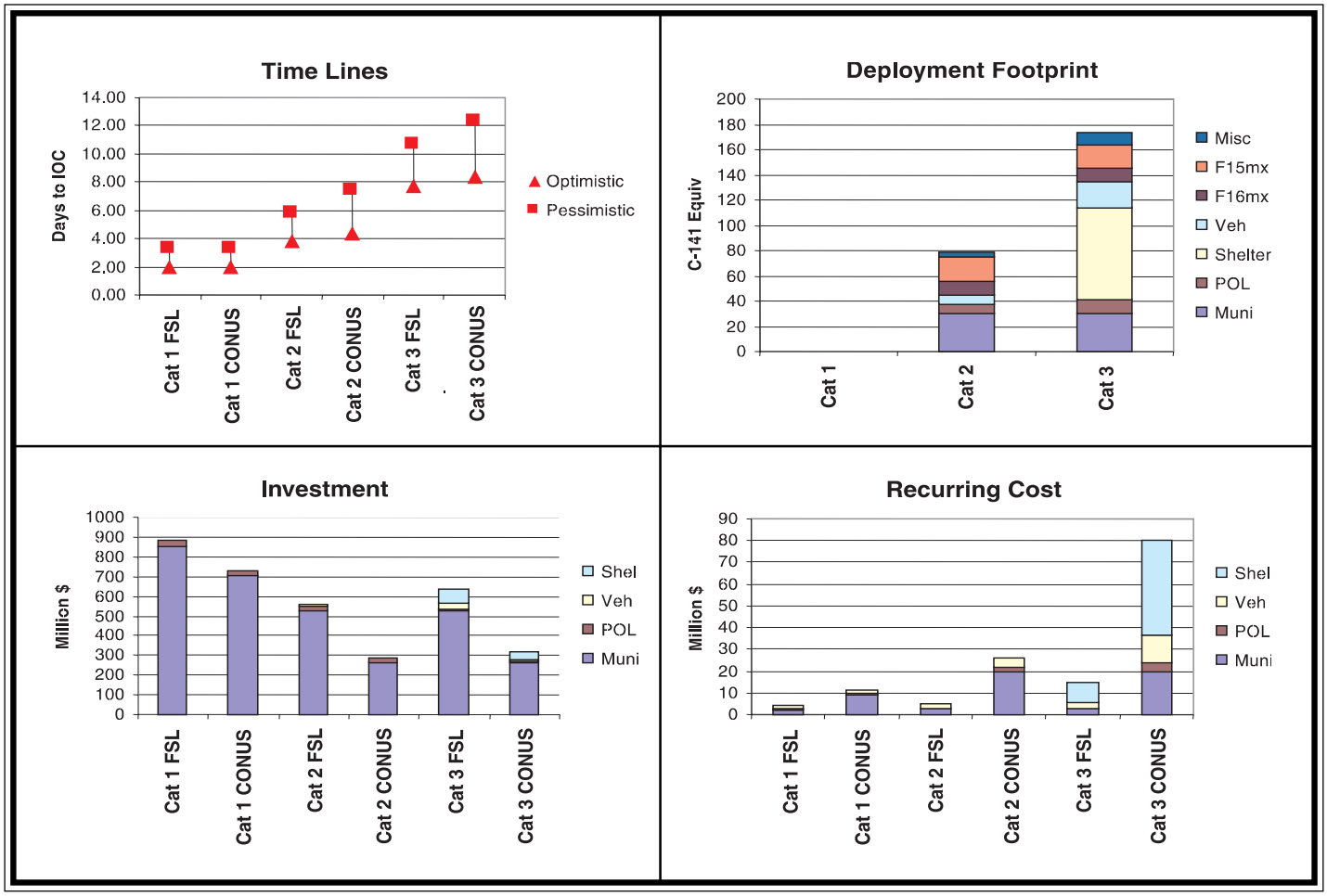

Figure 5. Employment-Driven Model, GBU-10 Scenario

The general pattern of each metric seems similar in this case, but closer comparison shows significant differences between the two cases. The SBS option seems to degrade the startup performance slightly because the increased bombload per sortie requires more bomb buildup work per flight. (If the SBS can be shipped in a full-up configuration, prebuilding the rounds on strategic warning at a storage site may reduce the time to IOC.) As expected, the deployment footprint is somewhat smaller, although the weight of munitions-handling equipment is still significant. Finally, the investment and recurring costs are lower for the SBS option. The investment decrease occurs because of fewer missile expenditures. In this scenario, there are fewer air-to-ground sortie requirements and, as a result, lower air-to-air requirements to provide suppression of enemy air defenses and air cover for the air-to-ground operations. The reduction in recurring costs comes from the reduced airlift needed to transport SBSs for exercises.[18]

Conclusions and Challenges

In looking at the current force structure and its current support processes, our analysis leads to several conclusions:

To get close to the execution order plus 48-hour deadline for placing the first bombs on target, AEWs must deploy to category-1 bases. Further, given that a flight halfway around the world takes approximately 20 hours, pushing the time line below 48 hours will require either having people deployed or materiel at an advanced state of preparation at the FOL or both.

Equipping numerous category-1 FOLs from scratch would be very expensive. Although much of the cost for current processes might well be sunk, maintenance and storage costs will still have to be paid. Anecdotal accounts of current (nonurgent) deployments to Southwest Asia indicate current maintenance arrangements there do not keep equipment ready for immediate use, suggesting that these costs might be larger than are paid now. Further, future munitions and improved support equipment not already in the inventory would have to be bought for the FOLs. Therefore, significant attention should be given to resourcing a number of FOLs in each category in order to provide a range of employment time lines for operational use. Within different regions, different employment time lines may be required. Not all regions may need to have category-1 FOLs or necessarily the same number of category-1 FOLs. The identification of various categories of FOLs throughout the world is important for supporting not only AEF operations but also major theater war operations. Attention should be given to pursuing host nation support agreements to the extent possible to offset costs and lift requirements.

FSLs provide a compromise in cost between prepositioning at FOLs and deploying everything from CONUS.[19] They have little effect on the time line for initial capability, but they do avoid the necessity of having a tanker air bridge for the extra strategic lift from CONUS. Further, the strategic lift then becomes available for use in deploying additional combat units.

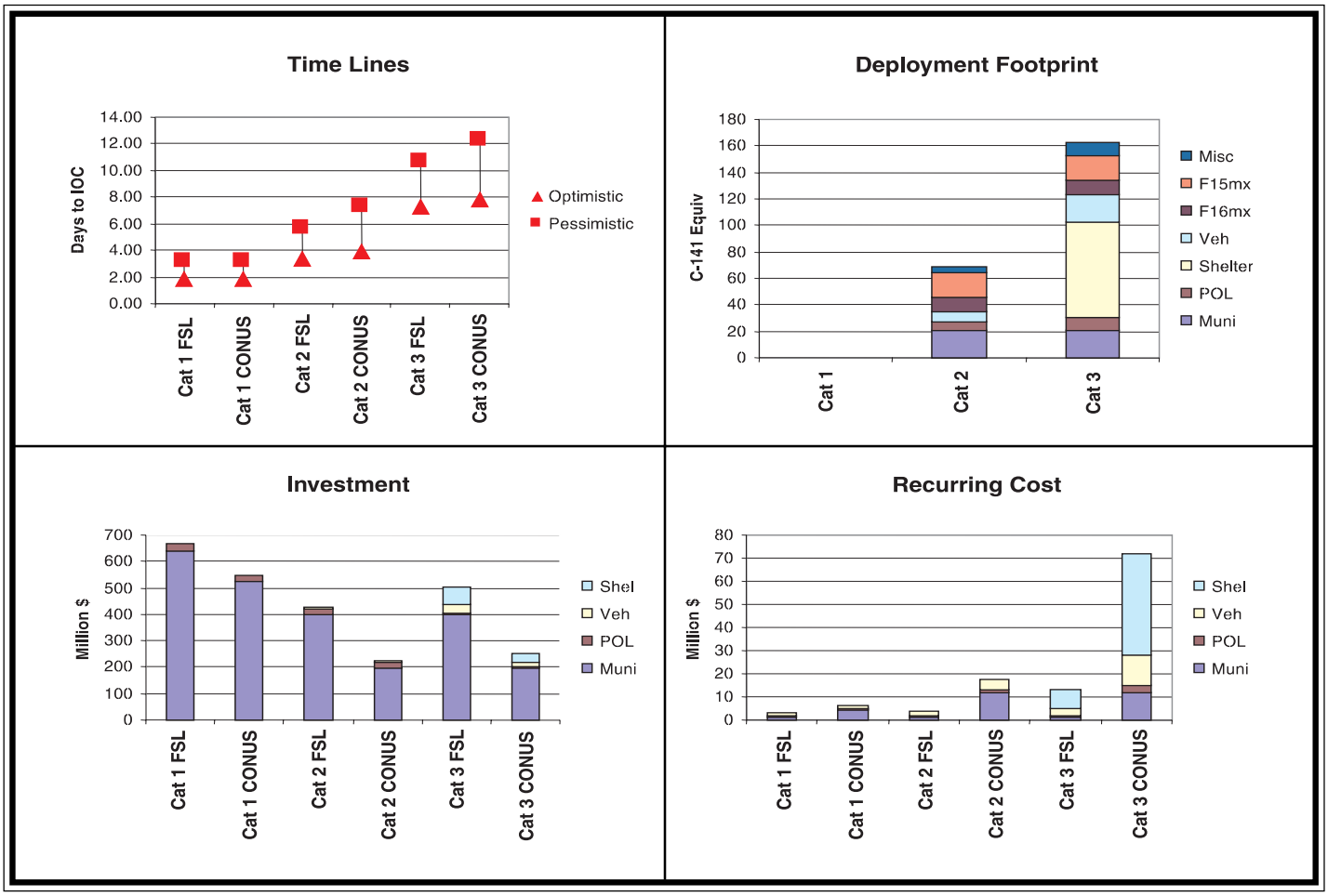

Figure 6. Employment-Driven Model, Small Smart Bomb Scenario

Category-2 bases represent another compromise between cost and time line. However, deploying to a category-2 base takes about 3.3 days (airlift flow and unloading airlift aircraft) and 2-3 days to set up munitions and fuels storage. Increased ramp space would not significantly speed up the deployment process. Plus, the agreements for vehicles, medical facilities, and so forth would probably require some time to finalize unless very complete arrangements had been completed well in advance.

Category-3 bases are not useful as FOLs for very quick crisis response given the time required for airlift offload operations and to set up the support processes. However, this is a function of the current processes, and the time line estimated here is for a stressing combat scenario. A less stressing combat scenario or a humanitarian operation might well be feasible from such a category-3 FOL within the 48-hour time line.

The concept of the Expeditionary Air Force has significant implications for two Air Force core competencies: Agile Combat Support and Global Mobility. Rapid deployment places an emphasis on reducing the logistics support that must be deployed, but the current force structure and current logistics processes mandate a forward logistics structure that prepositions equipment and support packages in order to meet potential operating tempos. FSLs, LOG C2, and very responsive resupply can also reduce the amount of materiel and people that need to be deployed to FOLs. New technologies and continuous process refinement can also reduce the deployment footprint over a period of years.

The deployment footprint could be reduced in three major areas: munitions, ground equipment, and shelters. Continued research is needed to reduce the weight and bulkiness of munitions and support equipment.[20] The weight and volume of the current bare-base shelter package could be eliminated via commercial alternatives, some of which are being explored by the Airbase Systems Command at Eglin AFB.

The issues concerning FOLs, FSLs, and their location and equipping require some planning decisions be made centrally from a global and strategic perspective. Those decisions should be revisited on a regular basis as the global political situation changes and as technology offers new options.[21]

Our research argues for three major policy changes. First, storage and maintenance policies for prepositioned equipment should be carefully formulated and rigorously enforced, especially if third-party contractors are used to do some or all of the work. Second, host nation support should be considered in planning and execution. How much support can the Air Force expect from allies and how does this change US support requirements? Finally, the other Services could use support concepts similar to the FSL/FOL mixes described here. Indeed, they have already raised similar ideas, and it may prove advantageous to share locations and some resources with them.

Notes

1. See, for example, Paul Richter, "The Tough Job of Keeping Soldiers Ready for War," *Los Angeles Times*, 22 November 1998, and "Buildup in Gulf Costly: Expenses, Stress Surge for Military," *Los Angeles Times*, 17 November 1998. Richter (17 and 22 November 1998) and Matthew Williams, "Plea for Help (from the Air Force Secretary and the Chief of Staff): Better Pay, Bigger Budgets Called Key to Fixing Readiness Woes," *Air Force Times*, 28 September 1998. However, some research has shown that some deployments may improve retention (James R. Hosek and Mark Totten, *Does Perstempo Hurt Reenlistment?: The Effect of Long or Hostile Perstempo on Reenlistment*, MR-990-OSD, RAND, Santa Monica, California, 1998)
2. As this concept has evolved, some of the details have been modified. At this writing, the structure consists of ten AEFs as described, two units for *pop-up* contingencies, and five AEFs for humanitarian/evacuation operations.
3. There is no general term for the force package actually deployed, although AES (for squadrons), AEW (for wings), and AEG (for groups) have been used. In this article, we call the actual deployed force of whatever composition an AEW.
4. Footprint is the name given to the size of the materiel needed to deploy a specific force. If airlifted, the footprint is expressed in airlift equivalents (for example, 12 C-141 loads); if stored, in terms of warehouse space.
5. Planners at US Air Forces in Europe have independently developed a similar classification for bases in their theater. HQ USAF/Installations and Logistics-Maintenance has also proposed a division of bases for their planning analyses.
6. These data are from the 4th Fighter Wing's deployment to Qatar, but other deployments have similar patterns. This deployment was not done on short notice, and there was little reengineering of support processes although unit type codes (UTC) were extensively examined and tailored. However, our models capture individual processes in sufficient detail to permit evaluation of process modification and tailoring.
7. More details may be found in Robert S. Tripp, Lionel Galway, Paul S. Killingsworth, Eric Peltz, Timothy L. Ramey, and John Drew, *Integrated Strategic Support Planning for the Expeditionary Aerospace Force*. RAND MR-1056-AF, Santa Monica, California, January 1999.
8. RAND is examining several issues germane to risk and flexibility (Wendt, 1998, unpublished research).
9. In our munitions modeling, we accounted for all munitions that would be used in support of this AEF force package including air-to-air munitions, HARM missiles, chaff/flares, and 20mm gun ammunition.
10. We have assumed that US forces must set up temporary fuel storage on a prepared site so that fuel for US aircraft can have additives added independently of host base fuel.
11. This does not take into account the much more demanding air bridge (tankers, airlifters) that must be in place to use airlift from CSLs.
12. Setup requires 4.6 days with a dedicated 150-person crew in a temperate climate.
13. There are two omissions from the investment cost. First, we defer considering the cost of building FSLs or constructing new FOLs in a theater of interest because these installations may be provided by an ally's bases or by adapting existing facilities. Second, we present the total purchase price without considering the fact that some of the equipment and consumable costs could be sunk.
14. The aviation maintenance equipment is assumed to be brought with the unit.
15. Each FSL has two sets of equipment, but if there is reachback to the CONUS, the CONUS only needs two sets total.
16. In this analysis, we assumed that each F-15E carried six SBSs.
17. The SBS is only under test and has not been procured. The costs shown here are, therefore, money that must be programmed and expended, unlike the costs for the GBU-10, which are largely sunk.
18. Note that we have assumed that rapid transportation is available for movement of munitions to an FOL when they are stored in an FSL or in the CONUS.
19. Much of the difference in recurring costs occurs because of the expense of running exercises from CONUS and the form of the exercises.
20. The AEF Battlelab at Mountain Home AFB is overseeing development of a combined compressor/air-conditioner for flight-line use, and the Aerospace Ground Equipment Working Group is investigating items such as collapsible maintenance stands. The Air Force Research Laboratory at Wright-Patterson AFB is investigating modular support systems for both legacy and future weapons systems.
21. For a more complete description of an enhanced planning process for global support infrastructure, see Tripp *et al.*, 1999.

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EAF strategic Planning

The EAF and Combat Support System Planning

Under the EAF concept, the Air Force is divided into several Air Expeditionary Forces (AEF), each roughly equivalent in capability, among which deployment responsibilities will be rotated.[1] Each AEF is required to be able to project highly capable and tailored force packages, largely from the Continental United States (CONUS), on short notice anywhere around the world in response to a wide range of possible operations. This concept requires the ability to deploy and employ quickly, adapt rapidly to changes in the scenario, and sustain operations indefinitely. To meet the demanding time lines, units must be able to deploy and set up logistics production processes quickly. Deploying units will, therefore, have to minimize deployment support. This, in turn, demands the support system be able to ensure the delivery of sufficient resources when needed to sustain operations.

To meet these operational requirements, the future combat support system should be designed to maintain readiness levels to support immediate deployments, provide responsive support to deal

with unanticipated events, provide support for the full spectrum of potential operations, transition support effectively as the units move along the spectrum of operations (transportation from one kind of operation to another), and be efficient and affordable. Moreover, maintaining readiness to meet potential major theater war (MTW) requirements while a significant portion of the force is temporarily deployed to meet boiling peacetime commitments presents additional support challenges. These challenges differ considerably from those posed by Cold War employment concepts and require a complete reexamination of the combat support system to determine how they can best be met. Strategic Agile Combat Support (ACS) design trade-off and investment decisions need to be made in the near term to create the ACS capabilities necessary to achieve the operational capabilities required in the future.

Focus on Strategic Planning

The time horizon over which planning is done determines a number of key planning process characteristics. These include the response time required to construct a plan, level of detail of

inputs, and flexibility of available resources. Planning for the ACS system could operate on three different time horizons at the:

- Level of execution (days to weeks): the ACS system should support ongoing operations.
- Midterm or strategic level[2] (months to years): the system should acquire or construct resources to support the current force structure across the full spectrum of operations and in any location critical to US interests, subject to peacetime cost constraints.
- Long-term level (decades): the ACS mobility system and its strategic infrastructure should be modified to support new force structures as they come on line and to utilize new technologies.

While much of the Air Force's attention has been focused on the execution time horizon to support the EAF, this segment of research concentrates on an integrated planning framework that addresses strategic decisions. These ACS system design and policy issue planning decisions made in peacetime affect the logistics footprint, closure time, peacetime costs, and other important metrics for evaluating support of expeditionary operations. The goal of this research is to begin formulating a strategic planning process that addresses how to make decisions about infrastructure development, resource positioning at forward or rear locations, and other policies and practices affecting logistics support.

An Enhanced Strategic ACS Planning Framework for the Expeditionary Aerospace Force

A detailed, continuous, careful end-to-end planning process focusing on strategic time horizons is required to develop the infrastructure necessary to transition to the EAF effectively and efficiently. Further, much, if not most, support effectiveness comes from planning and decisions made for these longer time horizons where options include redesigning support equipment, developing support processes and infrastructure, setting up prepositioned resources, and negotiating base access and relationships with coalition partners.

Characteristics of Strategic ACS Planning in the EAF Environment

Generally, a strategic ACS planning system for the new environment should assess how alternative logistics designs affect a number of important metrics. These include time lines to achieve the desired operational capabilities, peacetime costs, risks, and flexibility. It should also provide feedback as to how well the existing ACS system meets the spectrum of operational requirements. In comparing the current planning system with the ACS planning requirements for the EAF concept, enhancements should be made in the following areas:

- **Supporting the entire spectrum of operations.** The current planning system assumes that combat support capabilities designed for Major Theater War (MTW) scenarios can handle any situation. However, resources required to support peacetime operations (missions other than war) may be greater than or differ substantially from those required for MTWs.
- **Dealing with uncertainty.** Expeditionary operations are fraught with uncertainty. For example, denial of base access may require both preparation of several reception sites (forward operating locations) to support combat operations and minimal resource prepositioning at multiple sites to increase the probability of access. Moreover, there is great uncertainty surrounding the operational scenario, which will greatly affect support resource requirements. For instance, low operating tempos (OPTEMPOs) may require far less prepositioned resources to meet rapid employment time lines, whereas high OPTEMPOs may create a need for much more prepositioning. The current planning system, which focuses on MTWs, needs to be enhanced in order to address these uncertainties as well.
- **Evaluating alternative designs for deployment/employment time lines and associated costs.** The EAF concept emphasizes rapid deployment time lines that should be accounted for in future ACS system design. Alternatives to achieve fast deployment (for example, prepositioning equipment, developing FOLs with adequate facilities and resources to support rapid deployments and immediate employment, and developing host nation support agreements) have significant peacetime costs. On the other hand, the time lines might be slightly longer if materiel were held at regional storage sites. This would significantly lower costs. Assessing such trade-offs between time line, cost, and risk is integral to future strategic ACS system planning. The current support planning system does not address these issues.[3]
- **Integrating ACS planning among support functions and theaters and with operations.** The current combat support planning system is stovepiped in several ways. Each commodity and its support processes are viewed largely independently in order to determine resource requirements. In this fragmented process, opportunities to develop consolidated support operations or other policies that may support more than one theater may be missed. Moreover, feedback needs to be provided among commodity managers (for example, engines and low-altitude navigation and targeting for night) so they may determine how the best support option for one commodity (for example, consolidated intermediate maintenance) may affect the *best* ACS design for the other. Additionally, feedback on support options and costs needs to be provided to operations planners for trade-off analysis decisions. As an example, a deployment window of 96 hours versus 40 hours produces dramatic savings of resources.
- **Integrating the assessment and development process for technology and policy.** In the areas of technology and policy, many different organizations and agencies are pursuing initiatives that are part of the overall ACS system. However, these initiatives are formally uncoordinated below the level of the Air Staff. There has been little attention given to developing a capability that can evaluate options among those sets of competing policies and technologies that may be developed both to

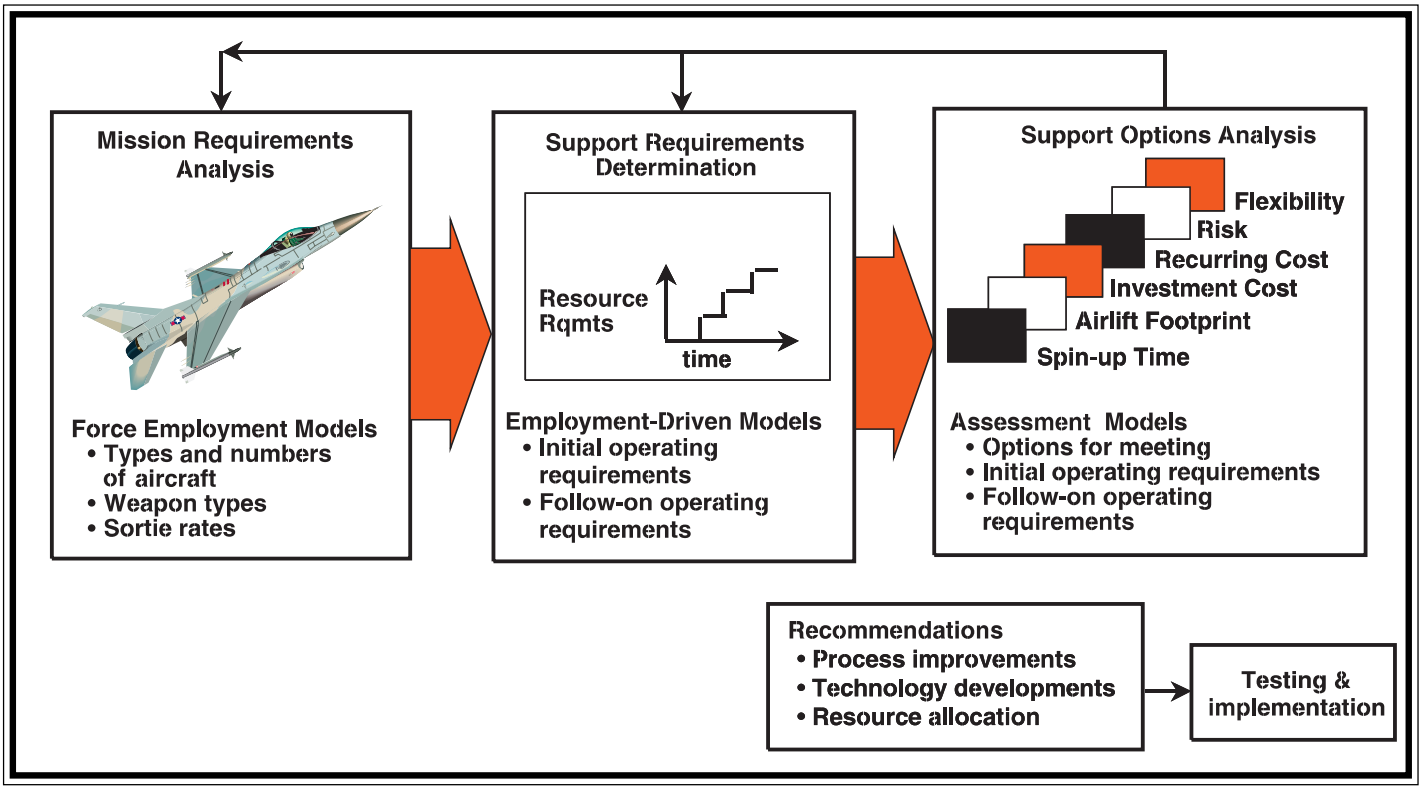

Figure 1. Employment-Driven Combat Support Requirements Generation

produce the most cost-effective global ACS capability and serve multiple theaters and operational scenarios.

- **Controlling variability and improving performance.** Ensuring that a redesigned support process is working and identifying areas for improvement will require monitoring the support system as it evolves, yet feedback for system design improvements is not routinely captured. A few critical parameters drive wartime and peacetime requirements for resources. While some of these parameters are measured, much improvement can be made in controlling their variability. Further, improvement may be made by developing a measurement system that can indicate when corrective action is needed or when the system may need redesigning.[4]

A Framework for Strategic ACS Planning Employment-driven ACS Requirements Determination

The approach to requirements generation and determination is called *employment driven* because it starts with operational analysis: forces, weapons, OPTEMPO, and required time lines. These key parameters determine most of the support requirements. This step is the leftmost panel in Figure 1, which depicts the overall approach to analyzing support requirements.

The middle panel represents the requirements determination model, which generates time-phased combat support requirements for each support resource as a function of the operational requirements and alternative logistics policies, practices, and technologies. ACS planning is beset by uncertainties and options. Some simple aggregated spreadsheet models were constructed to compute requirements for fuel, munitions, vehicles, support equipment, and shelters. As these models are easier to specify and run than the usual highly detailed models, they may be used to quickly screen several scenarios permitting a more thorough analysis of uncertainty. Yet, these relatively simple models provide enough detail to estimate the personnel, equipment, and commodity requirements to support alternative operational requirements and the timeframes required to assemble the production function for those commodities and operate them to sustain operations for an operational scenario.

For example, in the fuel model, the refueling system requirements (number of R-9 refuelers) are determined by the aircraft go sequence, aircraft fuel acceptance rates and capacities, and refueling system flow rates. For refueling by truck, the system flow rate would be determined by the truck acceptance rate, distribution system pumping rate (fill stand), and driving time to and from the fill stands. While not a detailed simulation of the fuels support operation, the model can be used to compute requirements for a number of fuel reception, storage, and distribution methods.[5]

As noted in the middle panel of Figure 1, two of the key outputs from the requirements determination models are the initial operating requirement (IOR) and follow-on operating requirement (FOR) for each resource (if applicable). The IOR is the amount of resource that is necessary to initiate and sustain operations while resupply pipelines are initiated for that resource. In the case of munitions, it may be that 3 days are required to reestablish resupply of munitions. Thus, 3 days of munitions would be the IOR. The FOR is the projected amount of the resource that is required during the remainder of the planned operation. The FOR can be delivered periodically to keep the flow of resources into the FOL easy to handle by a relatively lean forward support force. These parameters are the key to

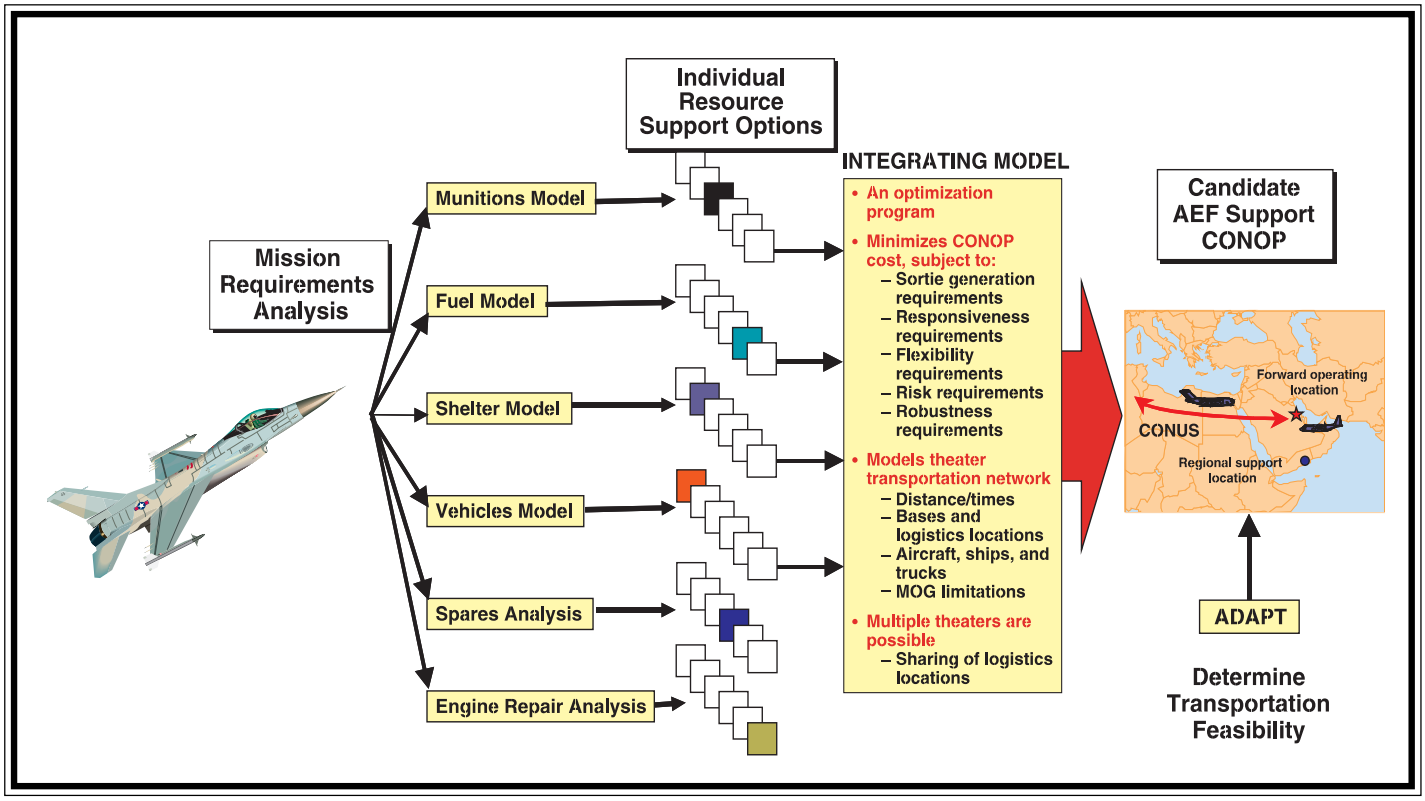

Figure 2. The Integration Model Assists in Choosing Among EAF Support Options

determining deployment resources and time lines and sizing the resupply capability, respectively.

As depicted in the rightmost panel of Figure 1, the support options for various commodities need to be evaluated across the different phases of operation. As with operational analysis, the aim is to identify support options that provide good performance (in terms of the set of metrics) across all phases of operation and across a range of potential scenarios (the number and range depending on the time horizon under consideration). Again, trade-offs may have to be made across the scenarios and the metrics (for example, a low-cost option may have a large risk). Additionally, support options may be evaluated for different mixes and for CONUS versus forward-based logistics. This approach allows these trade-offs to be made with a clear picture of the effects across different options and scenarios.

Integration of Individual Commodities Options into an ACS System

The next step is to select options in each of the commodity areas to create candidate AEF support concepts. As shown in Figure 2, preliminary work was done on an *integrating model* to choose among the options analyzed. This is a mixed-integer optimization model that selects combinations of the options that meet the objective function subject to several constraints and thereby quickly identifies feasible support concepts. Taken together, these options represent a possible support concept for AEFs that could then be looked at more closely to consider additional issues, such as the flexibility of the concept and its transportation feasibility.

For each commodity considered, the model can select from as many as six alternative ways to provide the resources needed to support operations. Each option has different fixed (investment) and variable (recurring) costs and varies according to its robustness and suitability for long-term use.[6]

The model accounts for such issues by allowing each option to be given a subjective rating with respect to its robustness. It then requires options with low robustness (but high initial deployability) to be replaced by more robust options within a specified period of time.

While the model allows the identification of potential EAF support concepts, it is also useful in answering a range of questions that give insight into the robustness of the concepts. For example, by varying the costs of certain aspects of a concept of operation (CONOP), the *breakpoints* could be identified that would motivate a switch to another CONOP. This allows a number of important questions to be explored; for example, the maximum desirable cost associated with the opening of a new forward support location or how sensitive a CONOP might be to annual transportation costs. Another important issue that can be analyzed by the model is the effect of various levels of airlift availability, which is a key make-or-break assumption associated with each AEF support CONOP. Finally, the payoff of improved technology to lower the deployment footprint of a resource option could be explored. In this way, the effect of an improvement in the deployability of a particular resource on the overall AEF deployment could be gauged.

As the Air Force extends its analysis of support structures beyond single theaters of operation, the complexity of issues will make the application of automated techniques, such as the integrating model, essential. The complex interactions between the region-specific security challenges, mutually supporting theaters, geography, and required levels of responsiveness will create an almost overwhelming number of possible support

structures. Automated models such as the integrating model are needed to manage this complexity in order to identify low-cost global support structures for the EAF.

Integration of ACS and the Mobility System

Executing AEF deployments requires that a multitude of mobility-related actions be set in motion. These include forward positioning of tankers, deploying aerial port personnel, placing mobility crews in crew rest, and so forth.

Mobility processes comprise a substantial portion of the overall AEF deployment time line. As interweaving mobility processes with logistics support processes are a key aspect of future AEF Agile Combat Support structures, there should be a way to test the mobility/logistics interfaces for any candidate AEF support structures devised. Toward this end, a high-level simulation model of the air mobility system, called the AEF Deployment and Planning Tool, was developed.[7]

This model provides insight into the chain of mobility-related events that makes AEF deployments possible, and can test the transportation feasibility of possible AEF support structures.

Feedback Loops for Control

The final element of the proposed planning framework is feedback, which provides indications that there are discrepancies between plans and reality. Information on deviations from plans can be used to initiate correctional actions to solve the problems. Two primary feedback loops are envisioned in the planning framework.

The first feedback loop is between logistics planning and operations planning as shown at the top of Figure 1. Operational analysis can provide alternative force packages that can accomplish *equivalent* goals. This is important because the alternative force packages can have very different support requirements.[8]

In some circumstances, logistics constraints may not be removable because some logistics resources may be strongly tied to an expensive and relatively fixed infrastructure that has limited flexibility. For example, fuel resources available within a given country and distribution capabilities to forward operating bases may not be available to support a sustained, high EAF OPTEMPO. Operational plans may have to be modified to deal with this constraint. This requires close interaction between logistics and operations in designing the ACS system of the future. With these strategic time horizons, the interaction needs to be continuous but not real time. Time is available to plan and acquire a logistics infrastructure that can support more ambitious operational plans if the costs and risks are judged to be acceptable.

The second feedback loop is between logistics planning and the control of the logistics infrastructure. First, there is a diagnostic loop in which logistics constraints identify areas of the ACS system where enhancement is needed. The diagnostic results are used to focus modifications on the logistics infrastructure to enhance its capabilities at the points where such improvement is needed to support operational plans.

A tracking and control feedback loop is needed to monitor the performance of logistics processes that are not (currently) constraints and ensure their performance remains adequate. These feedback loops and control system ensure the logistics system evolves as needed to support current and future operational plans and the system achieves and maintains the required support capability.[9] The result is a continuous cycle of planning, diagnostics, improvement, and replanning.

Planning Process Modifications and Organizational Development to Support Continuous Expeditionary ACS System Planning

The proposed support planning system likely requires integration across Air Force organizations and across commodities with one agency endowed with responsibility and authority to integrate and rationalize this global strategic planning from an Air Force perspective. While each major command (MAJCOM) and appropriate numbered air force would be responsible for developing ACS requirements based on its own area of focus, appropriately supplemented by other internal and external organizations, the requirements should be analyzed and integrated at a system level, ensuring trade-offs are made and resources are directed appropriately. There are several ways the Air Force could organize to develop the future combat support system using the process described above.

One option for integration is that the Deputy Chief of Staff, Installations and Logistics could initiate organizational and process changes needed to support the new strategic ACS planning framework by creating a director for ACS Design and Development. Each of the functional areas would be represented in this organization.

Another method to integrate the development of combat support requirements across all command lines is to include them in an ACS Technology Planning and Policy Integrated Process Team (TPPIPT), which would formally review the MAJCOM outputs on a periodic basis. Membership of this TPPIPT might also be expanded to include coalition partners, academics, and *think tanks* to help ensure policy alternatives receive due attention.

A third option for accomplishing this integration would be to continue the functioning of the Air Force Directorate of Expeditionary Aerospace Force Implementation (AF/XOP) and extend its charter to evolve the ACS system of the future along with developing new employment concepts.

With regard to implementation, the Air Staff could delegate most of these responsibilities to the MAJCOMs in a system of centralized control but decentralized execution. The integrating agent, either the Director of ACS Development, the TPPIPT, or AF/XOP would provide direction and guidance to the MAJCOMs to ensure multiple area-of-responsibility (AOR) infrastructure developments are considered. As requirements are approved for development, they could be approved for funding and delegated to the MAJCOMs. Alternatively, the responsibility for acquisition and maintenance of the global support infrastructure could be the responsibility of a system program office for infrastructure at Air Force Materiel Command, which would be responsible for building the infrastructure and ensuring its performance meets the needs of operators.

Specific Elements of an ACS Planning Framework for the EAF

Based on the foregoing, the following elements can be seen to be integral components of an enhanced ACS planning framework:

- A closed-loop strategic ACS planning process to develop alternative strategic designs for the EAF concepts of the future. This planning framework would be provided to the MAJCOMs for development of specific AOR ACS designs in concert with the warfighting commander in chief's A3.
- Use of employment driven end-to-end requirements generation models to specify requirements as a function of operational requirements and logistics policies, practices, and technologies for important logistics commodities and processes.
- Use of support options assessment models to compute metrics to compare alternative approaches for satisfying the requirements for individual commodities and processes across the phases of operations—peacetime operations and readiness preparation, deployment, employment/sustainment, redeployment, and reconstitution.
- Use of an integration model to evaluate integrated commodity ACS structures and processes.
- Evaluation of the impacts of uncertainty and alternative transition paths to MTW operations.
- Use of measurements and assessments of actual process performance and resource levels with those that were planned.
- Designation of ACS planning and assessment responsibilities to direct and advocate the strategic system design and evolution.

The EAF concept is a radical departure from past Air Force employment concepts. It holds promise for enhancing the Air Force's ability to deal with a new and uncertain international environment while alleviating some of the serious readiness problems being caused by lengthy overseas deployments. An integrated, continuous strategic ACS planning process will enable the realization of the full potential of EAF capabilities.

Notes

1. As this concept has evolved, some of the details have been modified. At this writing, the structure consists of ten AEFs as described, including two units for pop-up contingencies and five AEFs for humanitarian/evacuation operations.
2. The term strategic is used because these decisions are affected by not only time horizons but also the geopolitical strategic situation, technology, and fiscal constraints. As will be argued, these decisions have to be made by complex trade-offs of risk and benefits using criteria that are strategic in the broadest sense.
3. Logistics planners in US Central Command Air Force have had to develop their own methods to address these questions since they may host many deployments.
4. Raymond Pyles and Robert S. Tripp, "Measuring and Managing: The Concept and Design of the Combat Support Capability Management System," Santa Monica, California: RAND, N-1840-AF, 1982.
5. To determine munitions support and avionics repair requirements and associated personnel and equipment workload, new algorithms and modeling technology had to be developed. In other cases, suitable models exist or can be modified to generate requirements for resources. Such is the case for spare parts. In this case, the Aircraft Equipment Model provides requirements for spares as a function of OPTEMPO, force module size, maintenance concept, resupply times, and so forth.
6. For example, an austere shelter option may be permissible during the first few days of a deployment but may be replaced by a more robust option as time goes on and the airlift capacity is available.
7. The model is programmed using ithink Analyst software. (ithink Analyst Technical Documentation, High-Performance, Inc., Hanover, New Hampshire, 1997).
8. For instance, an AEF operational analysis might indicate that, under some scenario variations, an AEF composed of 12 F-15Es, 12 F-16Cs, and 6 F-16CJs could produce the same results as an AEF composed of 18 B-1 bombers and 6 F-16CJs. The support requirements and corresponding support alternatives are very different for these force packages. They may also have different deterrent implications. The fighter package may involve bedding down the force closer to the adversary. Using the reception sites of a neighbor may have a greater deterrent impact than indicting to an adversary that punitive strikes may be inflicted from bomber bases located farther away. These alternatives also have different costs and risks.
9. Pyles and Tripp.

notable quotes

When it comes down to the wire and the enemy is upon you and you reach into your holster, pull out the pistol and level it at your adversary, the difference between a click and a bang is logistics.

Editors of *Loglines*

Teamwork allows us to be an effective fighting force—a rapid expeditionary force capable of deploying anywhere in the world in a minimum of time and in austere conditions—not operating from where we are stationed, but from where we are needed, not when we can, but when we must.

General Michael E. Ryan, Chief of Staff, USAF

expeditionary airpower

2000

AEF

Future RAND/Air Force Logistics Management Agency EAF Articles

- Engine support options to enhance the effectiveness of the Expeditionary Aerospace Force (EAF).
- Logistics command and control system requirements to support the EAF.
- Distribution and transportation requirements to support and sustain the EAF.
- A review of Operation Noble Anvil lessons learned.

The increasing number of deployments launched on short notice to unpredictable locations presents new challenges to Air Force personnel and capabilities.[1] Further, continued political expectations for a high-operating tempo and rapid response capability have forced the Air Force to develop new concepts of operation. Together, these have led the Air Force to develop the Expeditionary Aerospace Force (EAF) in order to provide sustainable, quick-strike capabilities to project power worldwide.[2] The F-15 weapon system will play an important role in the EAF for several years in the future. This article examines how alternative F-15 support structures shape the effectiveness and efficiency of EAF Agile Combat Support (ACS).

F-15 support analysis

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RAND and Air Force Logistics Management Agency researchers have been exploring promising alternative support concepts to support the EAF operational strategy. Comparisons of these concepts to each other and to the current system have been based upon six Air Expeditionary Force (AEF) logistics metrics: spin-up time, airlift footprint, operational risk, operational flexibility, investment, and recurring costs. Analyses indicate that varying the structure according to support location proximity to operations—with the operational unit at another forward location in theater or in the Continental United States (CONUS)—creates trade-offs among logistics metrics. In some instances, technologies and process methods can change the trade-offs inherent in a given structure, reducing negative features while preserving positive ones.

This article specifically examines alternative F-15 avionics intermediate maintenance structures and explores how different technology and process capabilities affect the likely cost and performance of the structures. The level of support consolidation and proximity to the fighting units, ranging from the current decentralized practice of deploying intermediate maintenance with the deploying unit to a small network of support locations (or even a single location), characterizes the alternative structure options. Technologies, policies, and capabilities combine with the structure options to form a rich array of possibilities from which the Air Force may choose the best ACS system to meet uncertain scenarios. Our goal is to highlight the key issues affecting the possible decisions and to illustrate some of the trade-offs the Air Force faces in these decisions.

Support Structures, Policies, and Technology Create the *Trade Space*

The analysis centers on the level of consolidation chosen for support operations. The Air Force currently decentralizes F-15 avionics maintenance by deploying testers from home bases to forward operating locations (FOL) with aircraft. A variation of this system is the *decentralized no deployment* option in which the avionics intermediate shop (AIS) would not deploy with its squadron to FOLs during combat operations. Other options rely on varying levels of consolidation. These range from using a single CONUS support location (CSL) to using a CSL in network with two to four forward support locations (FSL).

While structure decisions may focus on support locations, they should not do so exclusively. Adopting new procedures or technologies can affect how different support structures compare to each other. Considering faster order and shipping times (OST) than those achieved today can provide insights into the logistics system that can justify a push for new transportation concepts or processes. Implementing new technology such as the new electronic system test set (ESTS) is also likely to affect the six AEF support metrics.

In analyzing different support structures for the AEF, an employment-driven modeling approach or an approach shaped by mission and support requirements and options was used.[3] The first step in this approach is shown in the left panel of Figure 1. In analyzing mission requirements, force employment models are used to determine the force package and operating tempo necessary for anticipated missions.

This information is used to estimate initial deployment and subsequent sustainment requirements, as shown in the middle

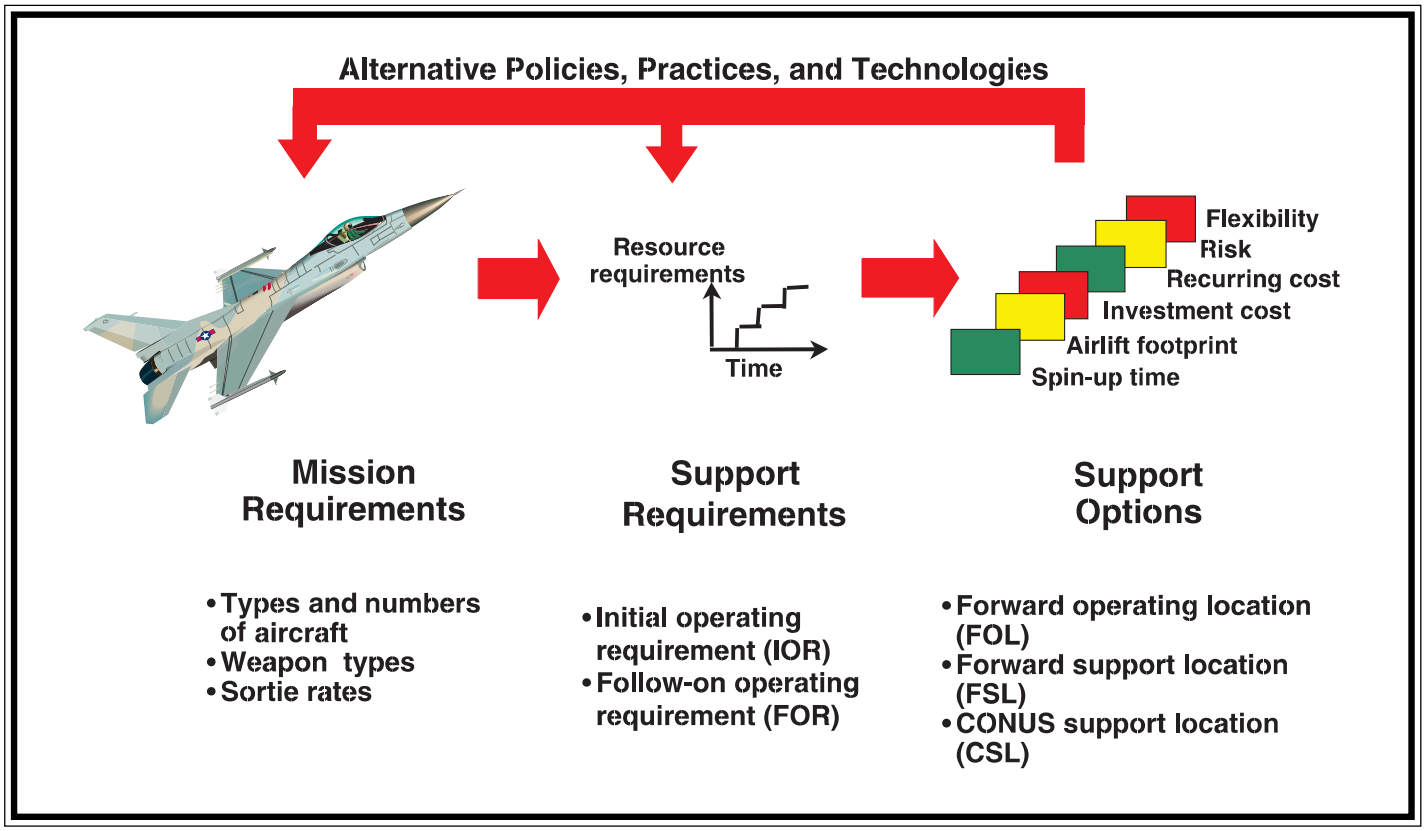

Figure 1. Employment-Driven Modeling Approach for Evaluating ACS Systems

panel of Figure 1. The demand for avionics components then drives the requirements for maintenance equipment and personnel, spare parts, and transportation resources. The last step in this process is to determine the spin-up time, airlift footprint, cost, risk, and flexibility of each option, as shown in the right panel of Figure 1. In some cases, this will show that all of the alternatives are incapable of meeting operational needs. If this is the case, it should guide modification of mission planning or development of new alternatives. In this way, logistics and operations planners can work together in an iterative process until the best solution, given resource constraints, is reached. At the end of the process, mission requirements and logistics capabilities should be consistent and well understood.

Costs

The study examined several types of costs across six support structures for F-15 intermediate avionics maintenance. These costs include those for testers, personnel, spare parts, and transportation. As mentioned, the six support structures analyzed are defined primarily by level of consolidation. These are (1) the current decentralized system, (2) a *decentralized no deployment* system, (3) a network of four FSLs and one CSL, (4) a network of three FSLs and one CSL, (5) a network of two FSLs and one CSL, and (6) use of only one CSL for avionics maintenance.

Tester Costs

For the current decentralized system, $12M is needed for additional Tactical Electronic Warfare Intermediate Support System (TISS) testers. Analysis shows the Air Force currently lacks the six TISS stations needed to meet wartime requirements for two coincident major theater wars (MTW). This cost would not be incurred for the centralized structures, because these structures would require fewer total testers. In this case, the current decentralized inventory is more than sufficient. In fact, with the current testers, analysis indicates consolidated support would cut worldwide tester requirements by 50 percent.

For the ESTS configuration, costs include remaining program funds and, for the decentralized structure, $22M for the additional procurement of three ESTS units and six TISS testers. With ESTS, consolidation would cut total tester requirements by about a third. As with current testers, this reduced tester requirement does not produce savings, because existing tester inventory (including funds already expended for ESTS) is a sunk cost.

Personnel Costs

Based upon fully burdened Air Force personnel costs[4] for the authorized grades and skill levels planned for staffing and supervising test stations,[5] personnel costs are estimated to be about $42K per person. Expressed in 8-year, net present value (NPV) terms,[6] total personnel costs necessary to satisfy two MTW demands, using the current testers, range from about $450M with complete consolidation to nearly $900M for the decentralized structure. Personnel costs using the ESTS range from about $400M with consolidation to about $650M for the decentralized structure. The model suggests the need for a slight increase in Air Force avionics maintenance personnel if the Air Force adopts ESTS under the current structure, while consolidation would allow a reduction in personnel.

Spare Parts Costs

Spare parts costs increase as consolidation increases, because the length of the resupply pipeline increases. While consolidation yields some economy-of-scale *savings* for shop replaceable units, these savings are overwhelmed by the demands of longer pipelines for line replaceable units (LRU). To support the consolidated options, new spares concepts were developed, including a buffer stock at the consolidated sites to help ensure serviceable spares are available when requisitioned by a deployed unit. This is more cost effective than further increasing the depth of readiness spares packages (RSP). These buffer stocks are referred to as consolidated spares packages. In addition, the RSP that would support deployed options was changed to contain LRUs only, since avionics intermediate maintenance would not be deployed under the consolidated options. Finally, peacetime operating stocks were adjusted to support the pipelines between operating and repair locations.

Using today's order and shipping times would require an additive spare parts inventory cost of nearly $100M for the CSL/4 FSL option and more than $350M for the CSL-only option. Reducing OST, thereby reducing the pipeline length, greatly reduces these additive spare part requirements. For example, with OST 2 to 3 days shorter than current times, additive spare parts costs for the CSL/FSL combinations are about $50M. For the CSL-only option, the cost is about $250M.

Transportation Costs

In the current decentralized system, unserviceable three-level (remove-repair-replace) items are repaired on base and do not require transportation to a repair facility. In a remove-and-replace system used for consolidation, all unserviceable items must be shipped from FOLs or home bases to an FSL or CSL, and a serviceable part must be shipped back. Again, as consolidation increases, parts transportation costs increase, because fewer operating bases are colocated with repair facilities, producing an increasing reliance on transportation. Estimates, based on analysis, show the 8-year NPV of these transportation costs to vary from $28.1M for CSL/4 FSL structure to $44.4M for a single CSL.

Total Costs

The sum of 8-year NPVs for equipment, personnel, spares, and transportation equals the total costs for each option and test set, as shown in Figure 2. With baseline OSTs and the current tester configuration, the decentralized deployment option and the CSL/4 FSL option are nearly equal in total cost. The two options essentially trade off personnel and spare parts costs.

For the ESTS configuration with baseline OSTs, shown on the right side of Figure 2, the decentralized option costs slightly less than the CSL/4 FSL option, because the ESTS itself reduces personnel requirements.

Improved OSTs reduce the requirements for spare parts while keeping other costs constant. This makes the CSL/4 FSL option the low-cost option for using current testers. For ESTS with improved OSTs, the CSL/4 FSL option and the current decentralized support structure are about equal in costs.

Other Requirements by Structure

There are other critical dimensions beyond cost to consider in making support structure decisions. These include deployment

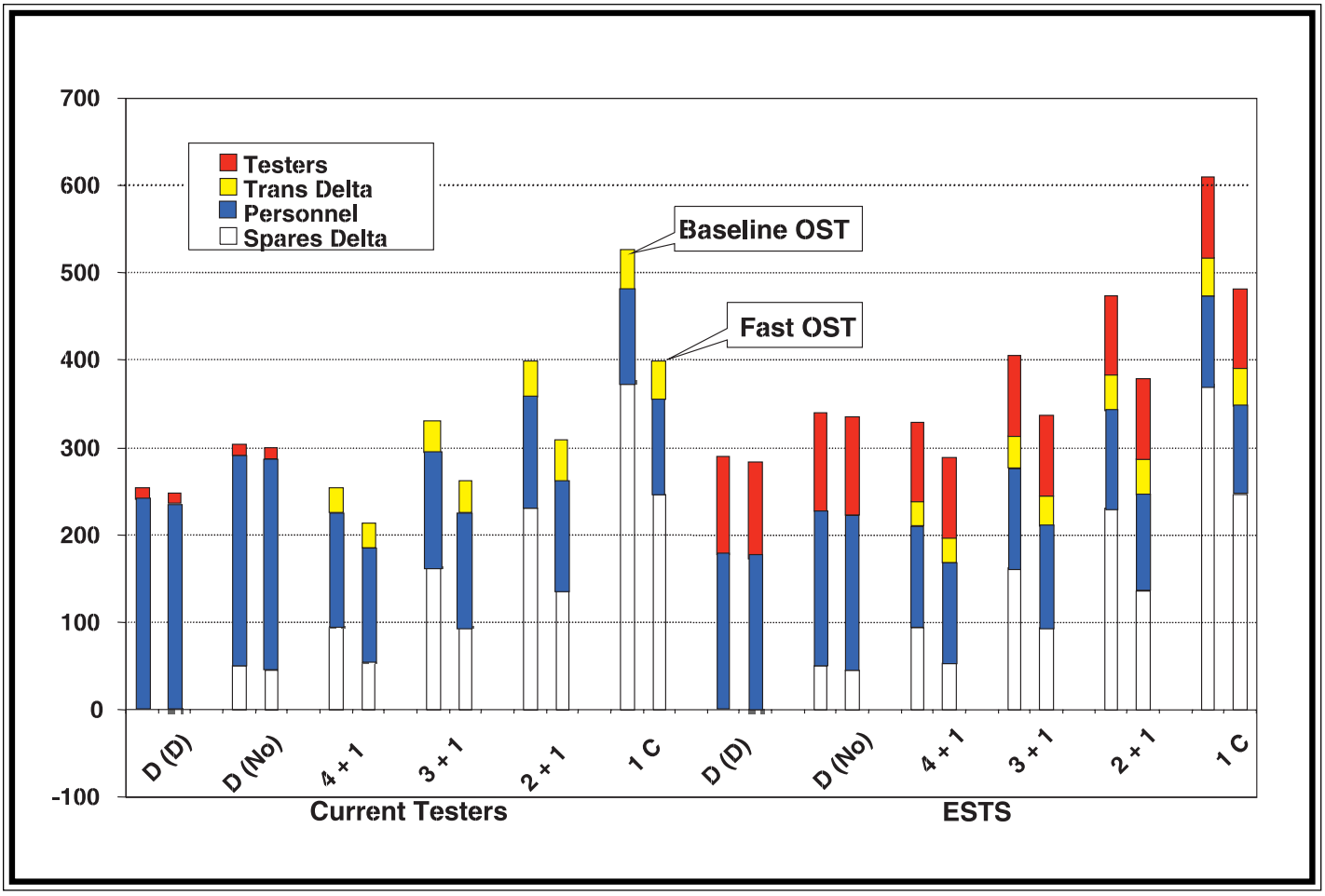

Figure 2. Total Cost by Structure, OST, and Tester Configuration

personnel requirements and quality-of-life issues, deployment footprint, and operational risks.

Deployment Personnel Requirements

Among the goals of the AEF is deployment predictability to provide stability for Air Force personnel. In this analysis, this goal is taken one step further by analyzing how to reduce deployment personnel requirements, not just how to make the requirements more predictable. The current decentralized deployment option has high deployment personnel requirements, while the decentralized no deployment option eliminates deployment personnel requirements. The consolidated structures eliminate deployments for small-scale contingencies and require just a small number of people to shift from CSLs to FSLs during major theater wars.

Deployment Footprint

A key element in successful quick-hitting expeditionary operations is the rapid deployment of strong combat forces. This puts a premium on reducing the deployment footprint or the amount of initial airlift space needed to transport initial operating requirements and combat equipment. For an MTW deployment, consolidated and decentralized no deployment structures reduce deployment footprint requirements for avionics intermediate maintenance by up to 60 C-141 (43 C-17) load equivalents. The adoption of the much smaller ESTS would reduce these savings to a maximum of 12 C-141 (9 C-17) load equivalents.

Reducing the deployment footprint provides a vivid picture of an objective that can be achieved in different ways. Either new technology, such as the ESTS, or policy changes, such as those for consolidation, can help reduce the deployment footprint. The key point is Air Force leaders can often choose from a variety of options to meet their operational goals.

Operational Risks

If resupply times for a given support structure do not meet the performance assumptions used to set spare parts levels, then aircraft availability may suffer. In a decentralized structure, the greatest operational risk is tester downtime. If a single set of testers is deployed, a breakdown of just one will temporarily eliminate resupply for a large group of LRUs. This is termed the *single string* risk.

In a consolidated structure, the greatest operational risk is OST and retrograde time performance. While the single string risk can greatly affect a small group of LRUs, OST and retrograde time risk is broader but also likely to be more moderate and gradual. In effect, single string risk cuts off resupply while a tester is down, while OST risk lengthens the pipeline. The severity of the effects of subpar OST and retrograde performance depends on how actual resupply time differs from the assumptions used to plan Readiness Spares Packages.

Support Option Advantages and Disadvantages

The *current decentralized system*, in which the AIS deploys to FOLs, has the advantages of low relative cost, greater certainty in resource requirements, and an existing infrastructure. Its disadvantages, however, are precisely the difficulties that have led to examination of alternatives and have caused many deploying units to modify their procedures informally.

Personnel under the current system are likely to face continued, frequent deployments, further contributing to retention problems among avionics technicians. Further, to meet operational objectives, the current structure requires more highly skilled personnel than are currently available in the Air Force. Besides the deployment of personnel, the current system of AIS deployment consumes valuable initial airlift space that might otherwise be used to close additional forces. When the AIS is deployed in a single string for small-scale contingencies, as specified by current doctrine, LRU resupply faces a high tester downtime risk.

Modifying the current structure to eliminate AIS deployment—or the *decentralized no deployment* option—eliminates the personnel deployment and airlift requirements. Moving to this system would be relatively easy since no new infrastructure would be needed, although an increase in the serviceable inventory of spare parts would require a one-time investment that makes this structure more costly than the current structure. The risk for this structure would be in resupply from CONUS.

Consolidated structures also reduce the personnel turbulence and deployment footprint concerns associated with the current structure while being cost competitive with the current structure. Like the decentralized no deployment option, consolidated repair depends upon consistently available transportation, but its transportation requirements are limited to shorter intratheater lift and present less management complexity.

Conclusion

This article focuses on *pure* structures to emphasize trade-offs created by the alternatives. The pure models help illustrate the sensitivity of the system to individual design parameters. From the pure models, Air Force logistics personnel may be able to develop hybrids, capturing the advantages of different structures to create even better alternatives or to improve implementation feasibility.

In fact, the 48th Component Repair Squadron at Royal Air Force Lakenheath, United Kingdom, implemented a hybrid strategy to support F-15 operations against Serbia in Operation Noble Anvil (ONA). Building upon their experience providing partial support for AEF operations in Southwest Asia (SWA) over the last 5 years, they supported initial F-15 ONA operations in Europe and continuing operations in SWA from Lakenheath with their existing assets. When deployment plans for additional aircraft were projected to exceed their support capabilities, they developed an augmentation plan with CONUS organizations. This plan, executed for logistics support even though the conflict ended prior to the deployment of the additional aircraft, cut airlift footprint and deployed personnel by more than 50 percent than would have been necessary had support deployed to the FOLs. In the long run, this method would reduce the additive spare parts requirements of consolidation, because it does not lengthen the peacetime pipeline. This hybrid plan struck a balance between the benefits of consolidation and decentralized support. For example, about half of the deployment airlift benefit was achieved with just a small increase in spare parts levels.

This is representative of the decision making needed to make the EAF work. First, the Air Force must determine how it values the AEF logistics metrics. Then, it should choose ACS options that best strike a balance between these values. The Lakenheath example provides an option with some reduced airlift and a limited increase in spare parts requirements, while a permanent FSL would further reduce airlift but require more spare parts (and fewer personnel).

The Air Force should carefully examine this ad hoc planning and implementation, which served as a concept test, as well as similar events occurring for other contingencies and for other commodities. Then, the Air Force should select and begin implementing its doctrine of the future. Thorough peacetime planning will allow a more seamless, effective transition to wartime operations.

Notes

1. Gen Michael E. Ryan, "Aerospace Expeditionary Force: Better Use of Aerospace Power for the 21st Century," Briefing, Washington DC, HQ USAF, 1998.
2. The AEF is based on the "Air Force Vision to organize, train, equip, and sustain itself to provide a rapidly responsive, tailored aerospace force for 21st century military operations." Its purpose is to improve response speed and flexibility while decreasing deployment strain for a CONUS-based Air Force. The AEF will organize the Air Force into ten virtual AEFs comprising combat, mobility, and support resources that joint force commanders can tailor to specific missions. Each of the five mobility wings will be paired with two AEFs and be on call with their AEFs. AEFs will operate on a 90-day *on-call* window once every 15 months. This should provide more personal stability for deploying personnel. Maj Eric Schnaible, "AEF Implementation," Briefing, Washington DC, HQ USAF/XOPE, 1999.
3. Robert S. Tripp, Lionel A. Galway, Paul S. Killingsworth, Eric Peltz, Timothy L. Ramey, and CMSgt John G. Drew, *Integrated Strategic Support Planning for the Expeditionary Aerospace Force*, RAND MR-1056-AF, Santa Monica, California, January 1999.
4. Application of Military Standard Composite Rate Acceleration Factors for Fiscal Year 1998, AFI 65-503, *Cost and Planning Factors*, Table A32-1, 23 April, 1998.
5. Manning Statistics by (Grades 33-39) HQ ACC/DPAA, July 1999 (Provided authorized and assigned numbers for each AIS).
6. An 8-year net present value of personnel costs is used, because test equipment is estimated to have a life-span of 8 years.

notable quotes

The only thing harder than getting a new idea into a military mind is getting an old one out.

B.H. Liddell Hart

a vision for agile

The development of Expeditionary Aerospace Force (EAF) operations requires rethinking of many Air Force functions. This includes the combat support system. To a large extent, success of the EAF depends on turning the current support system into one that is much more agile. In recognition of this, the Air Force has begun transforming the current support system to the Agile Combat Support (ACS system).[1] It has designated ACS as one of six essential core competencies for Global Engagement.

Developing the ACS system requires hard decisions concerning allocating the limited resources necessary for creating a system capable of meeting a wide range of uncertain scenarios. ACS requirements will vary with each scenario, and each scenario will require unique trade-offs, such as that between speed and cost or, more generally, between different characteristics valued by the Air Force. These trade-offs will change as support technologies, policies, and practices change.[2] As a result, ACS planning must be a continuous effort. The system itself must evolve toward a flexible logistics infrastructure that makes the best use of resources and information.[3]

This article offers a vision of what the future ACS system might look like and how it could help the Air Force meet EAF operational goals. This vision draws from ongoing RAND and Air Force Logistics Management Agency (AFLMA) research evaluating how ACS design options impact EAF effectiveness and efficiency. The ACS system will have to support EAF operations ranging from major theater wars (MTW), to small-scale contingencies, to peacekeeping missions.

It will likely need to be a global network that will comprise:

- Forward operating locations (FOL), with resource allocations that support differing employment time lines.

combat support

robert s. tripp, RAND
eric peltz, RAND
c. robert roll, RAND
lionel a. galway, RAND
timothy l. ramey, RAND
mahyar amouzegar, RAND
clifford grammich, RAND
john g. drew, CMSgt, AFLMA

- Forward support locations (FSL), with differing support processes and resources.
- Continental United States (CONUS) support locations (CSL).

These infrastructure elements need to be connected by a logistics command and control (LOG C2) system and a very responsive distribution system in order to ensure support resources arrive when combat commanders need them.

ACS Decisions and Their *Trade Space*

The Air Force recognizes that it must change the current support system to meet the needs of the EAF. Some elements and processes of the current system are remnants of a Cold War system designed to support the needs of large overseas forces that would be employed simultaneously in major conflicts occurring in Central Europe and Northeast Asia. Specific resources were provided to FOLs for waging combat in known places. Planners assumed the resources needed for MTWs would suffice for all lesser conflicts. There was less uncertainty to consider in such a planning environment.

Today, support resources must be designed to meet the needs of a smaller force facing a wide variety of scenarios in uncertain locations. The new planning environment also has limited resources for supporting multiple areas of responsibility (AOR). This means the future support system must be flexible enough to move resources across AORs.

Aviation unit type codes (UTC) were developed to be self-sufficient for 30 days. For EAF operations, UTCs designed for more rapid deployment require a smaller footprint, in turn, requiring immediate resupply after deployment. There must be a shift from reliance on large stockpiles of resources at FOLs to an emphasis on fast resupply to replenish smaller forward stocks.

More generally, support resources must be considered strategically rather than tactically. In the past, support requirements determinations have been made to calculate specific requirements needed to meet commander-in-chief responsibilities. Now support resource calculations and considerations must take into account a wide range of scenarios. Resources need to be distributed to meet wide variations in scenarios. The resulting resource mix may not be the best for any one particular scenario, but it may be the most robust against the entire range of scenarios or the mix that holds up best in the face of uncertainty. Thus, the future ACS system must be flexible, with logistics processes in place to determine how to move limited resources from one place to another in meeting rapid deployment, employment, sustainment, and reconstitution needs.

Specific key variables affecting ACS system design include:

- Options for force composition, employment time line, and operation tempo.
- FOL capabilities, including infrastructure and resources, as well as the political and military risks associated with prepositioning resources at specific locations.
- Technology options affecting performance, weight, and size of test equipment, munitions, support equipment, and other support.
- Resupply time, particularly as it affects initial operating requirements (IOR) and follow-on operating requirements (FOR).
- Alternative support policies, such as conducting repair operations at deployed or consolidated support locations.
- Strategic and tactical airlift capacity.

These and other variables form a rich array of decisions from which Air Force leaders will choose in designing the future ACS system. Generally, there are no right or wrong answers, but system trade-offs will be required.

ACS design decisions will depend on how Air Force leaders value different criteria. Some system needs—such as rapid employment time lines, high operating tempos, and airlift constraints—favor forward positioning of resources. Others, such as the cost and risk of positioning resources at FOLs, favor positioning of resources at consolidated locations.

Figure 1 depicts the general trade-offs. Investment costs are higher for an extensive support structure positioned at numerous forward locations. They decline as the number of support locations declines. Employment time is lower for an extensive support structure with numerous forward locations. It increases as the number of support locations decreases.

While the general direction of these relationships is fixed, the specific details are not. The arrow on the graph shows the effect of reengineering processes or implementing new technologies, such as developing lightweight munitions or support equipment. New technologies or processes can shift the time-line curve downward. This allows more rearward positioning of resources than would otherwise be possible.[4]

An Analytic Framework for Strategic ACS Planning

How can Air Force leaders evaluate and choose among ACS options? We propose an employment-driven modeling

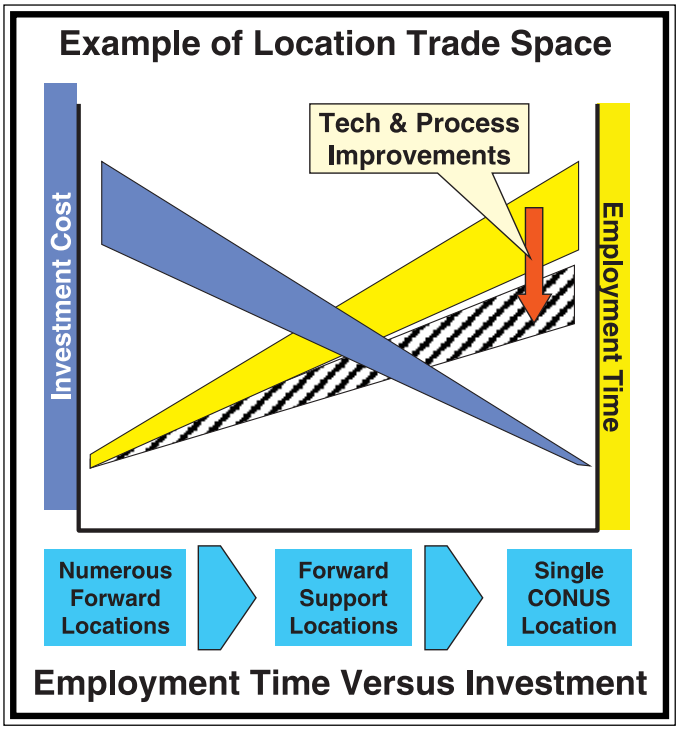

Figure 1. General Decision Trade Space by Locations

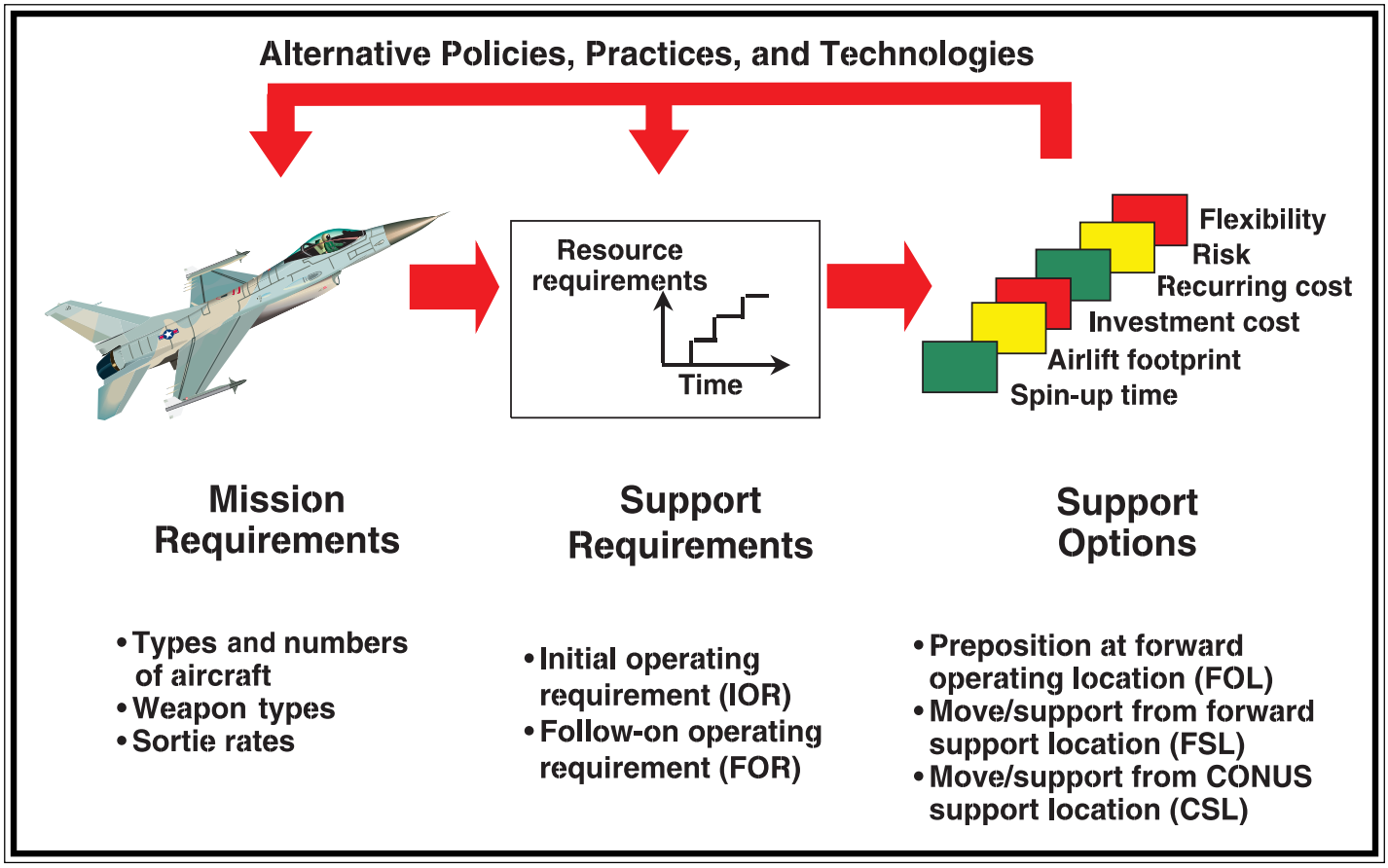

Figure 2. Employment-Driven Analytical Framework

framework. The core of this framework is a series of models for critical support processes that can calculate equipment, supplies, and personnel needed to meet operational requirements.[5]

These models are employment driven because they start from the operational scenario—or from the employment requirements—to provide time-phased estimates of support resource requirements. Once support requirements are computed, the models can be used to evaluate options—such as prepositioning support resources or deploying from consolidated locations—for satisfying them. The evaluation includes metrics such as spin-up time, airlift capacity, investment and recurring costs, and political and military risks. Figure 2 depicts the modeling framework developed in the analyses.

This framework is designed to address the uncertainties of expeditionary operations. The models can be run for a variety of mission requirements. This includes the support needed for different types of missions (for example, humanitarian, evacuation, or small-scale interdiction); effects on support system requirements of different weapon mixes for the same mission; the impact of different support policies, practices, and technologies; and other operation support needs.

The models have been designed to run quickly and estimate mission requirements at a level of detail appropriate for strategic decisions. This detail should include the number of people and large pieces of equipment that account for most mission support airlift footprints. It should also include enough detail so that major changes to support processes can be reflected in the model and evaluated against all metrics.

The final output of the modeling framework is an evaluation of the effects of each support option on spin-up time, airlift footprint, investment and recurring costs, risks, and flexibility. This shows the details of the trade-off between moving resources from centralized support locations or prepositioning them at FOLs.

ACS analyses may find that an option cannot be supported because of cost or process constraints. If so, then senior leaders can design an option with less cost or risk that would still achieve their goals. This framework thus can be used not only for ACS system analysis but also to support integrated analysis of operations, ACS, and mobility options.

Key Findings from ACS Modeling Research

Using an analytic framework and prototype models for some specific commodities has made clear the broad ACS system characteristics needed to support future expeditionary operations. An important finding of RAND/AFLMA research: the Air Force goal of deploying to an unprepared base and sustaining a nominal expeditionary force at a high operating tempo or a 36-ship package capable of air-defense suppression, air superiority, and ground attack aircraft cannot be met with current support processes. A 48-hour time line can be met only with judicious prepositioning and even then only under ideal conditions.

Table 1 shows the results generated from using a preliminary integrating model to minimize support costs and meet the employment time line while satisfying resource requirements for a 7-day surge employment scenario. These results were obtained by using inputs from our commodity models for munitions, fuel, vehicles, shelter, F-15 avionics components, and low-altitude navigation and targeting infrared for night (LANTIRN) needs for the 36-ship force.

Time Line	Forward Operating Location	Forward Support Location	CONUS
Initiate and sustain at 48 hours	Bombs (IOR) Fuel Shelter Vehicles	Missiles (IOR and FOR) Bombs (FOR) Repair: F-15 avionics and LANTIRN	Unit equipment Two-level repair
Initiate and sustain at 48 hours	Bombs (IOR) Fuel Shelter Vehicles	Bombs (FOR) FMSE Repair: F-15 avionics and LANTIRN	Unit equipment Two-level repair Missiles (IOR and FOR)
Initiate and sustain ops at 144 hours	Fuel	Bombs (IOR and FOR) Repair: F-15 avionics and LANTIRN Shelter Vehicles	Unit equipment Two-level repair Missiles (IOR and FOR) Fuels Mobility Support Equipment

Table 1. ACS Modeling

A 48-hour time line requires substantial materiel to be prepositioned at the FOL. A bare base can be used only if the deployment time line is extended to 144 hours and substantial materiel is prepositioned at a regional forward support location—or FSL—and if intra- and intertheater transportation is available to move resources to the FOL.

The reason for this conclusion is simple: current support resources and processes are heavy. They are not designed for quick deployments to FOLs having limited space for unloading strategic airlift. Significant numbers of vehicles and materiel-handling equipment—such as forklifts and trailers—are required to meet EAF operational requirements. The airlift required to move this materiel, not including munitions, is enormous, and it may not always be available.

Shelter needs place another constraint on options for quick deployment. The current Harvest Falcon shelter package for bare bases requires approximately 100 C-141 (72 C-17) loads to move and almost 4 days to erect using a 150-man crew. The construction time for the Harvest Falcon shelter package alone means it must be prepositioned to meet a 48-hour time line or even a 96-hour time line.

These results do not mean expeditionary operations are not feasible. Technology and process changes may reduce the need to deploy heavy maintenance equipment. For now, however, these results do mean that setting up a strategic infrastructure to perform expeditionary operations involves a series of complicated trade-offs.

Expensive 48-hour bases may best be reserved for areas such as Europe or Southwest Asia (SWA), which are critical to US interests or are under serious threat. In other areas, a 144-hour response may be adequate. In still other areas, such as Central America, most operations will be humanitarian relief missions that could be deployed to a bare base within 48 hours since combat equipment would be unnecessary. For all these cases, the models and analytic framework being developed can help in negotiating the complex web of decisions.

One key parameter that affects ACS design is resupply time. If resupply time is cut, the initial operating requirements and initial deployment can also be cut. In addition to IOR, resupply time affects repair locations. If resupply time is long, more maintenance equipment and personnel must be deployed to keep units operating, and greater quantities of supplies will be needed to fill longer pipelines.

Short resupply times can help in dealing with uncertainties caused by an inability to predict requirements or by changes in requirements resulting from enemy actions. A short resupply time provides the ability to react quickly to inevitable surprises, mitigating their impact.

The future ACS system needs to be designed around expected wartime resupply times, not peacetime resupply possibilities. To examine its constraints, resupply time was analyzed as it varies by delivery process and assumptions. Parts of these data were gathered from actual delivery times. Others were generated with models, using optimistic assumptions, which help show differences between possible and actual system performance.

The left most curve in Figure 3 (Air Mobility Express–Commercial [AMX-C]) shows the distribution of best expected resupply times for small items (less than 150 pounds) that could be shipped via express carriers to SWA from CONUS. This distribution includes the entire resupply time, from requisition to receipt, and has a mean of about 4 days, including weekends, holidays, and pickup days. This distribution was generated from a simulation model using very optimistic times for each part of the resupply process. It assumes the processes are perfectly coordinated with no delays due to weather, mechanical problems, or enemy actions. This curve represents a current process optimum to SWA.

The third curve (Air Mobility Express–Military [AMX-M]) shows the expected distribution of best resupply times to SWA for AMX-M, the system used for large cargo in wartime, under optimistic assumptions. Median resupply time for this system is about 7 days. The fourth curve (SWA) shows the current actual delivery times for high-priority cargo to SWA units. These data include delivery times for both small and large cargo. Note that half these requisitions took more than 9 days to deliver.

Operation Noble Anvil (ONA) provided extensive evidence of this challenge. The second left most curve (ONA Worldwide Express [WWX]) shows the distribution of WWX deliveries during ONA. WWX is a Department of Defense (DoD) contract with commercial carriers to move small items within the CONUS and from the CONUS to the rest of the world. The contract specifies in-transit delivery times for shipments between specific locations. Most in-transit times to overseas theaters are about 3 days, but this excludes the day of pickup and weekends.

During ONA, the resupply times to Europe using WWX averaged about 5 days, while more than 10 percent of the deliveries took more than 10 days. As shown in Figure 3, the large items moved by military flights averaged more than 15 days to deliver.[6] Even in a highly developed theater, for a benign conflict environment, resupply times are lengthy.

The Department of Defense recently established a resupply goal of 5 days to overseas locations and ordered inventory levels to be reduced to reflect these new delivery goals. RAND/AFLMA research, however, indicates that a resupply goal of 5 days to overseas FOLs may not be achievable for small items in all

wartime environments. Such a goal is probably not achievable for large items since the median of the expected delivery time distribution for such items under optimistic assumptions is 7 days.

As mentioned above, resupply time affects repair location decisions. Separate studies on maintenance support for key equipment in an expeditionary environment are being completed. For two cases in which the analysis is complete, F-15 avionics[7] and LANTIRN pod repairs,[8] the breakpoints for locating repair facilities in the CONUS or forward locations are shown at the top of Figure 3.

For F-15 avionics, consolidating repairs at regional or CONUS facilities sharply reduces personnel needs, as well as the need for some upgrades currently being considered for repair equipment. Resupply time for any consolidated repair facility, however, must be less than 6 days, or the longer pipeline will require substantial investments in new spare parts. Figure 3 shows that achieving such delivery times from the CONUS may be difficult, although data from theater support of mission capable (MICAP) requisitions indicates that transportation times from regional FSLs can meet the 6-day breakpoint.[9]

For LANTIRN targeting pods, for which no new acquisitions are planned, the breakpoint time line is even shorter because of the lack of spares. Maintaining the availability of working pods in an MTW requires transportation times of less than 2 days from a consolidated repair facility. Figure 3 shows that this is out of reach from the CONUS and it might even be difficult to achieve within theater. At the same time, however, deployment of LANTIRN repair to FOLs is not an attractive option. The test equipment is old, very heavy, and increasingly unreliable, so repair consolidation reducing the need for test equipment deployment may be required.

Models of individual support processes yield important insights for supporting processes for expeditionary operations. To plan an ACS system, outputs of models for different processes need to be integrated, and consideration should be given to the mixes of options. This may include a mix of prepositioning some materiel, deploying other materiel from FSLs, and deploying still other materiel from the CONUS. The research on this topic explores the use of optimization techniques to integrate options for several support processes.

From these analyses, it was concluded that performing expeditionary operations for the current force with current support processes and technologies requires judicious prepositioning of equipment and supplies at selected FOLs. This must be backed by a system of FSLs providing equipment and maintenance services. Such a system would require a transportation system linking FOLs and FSLs.

The Air Force already makes some use of FSLs, particularly for munitions and war reserve materiel (WRM) storage. Consolidated regional repair centers have also been established to support recent conflicts. During Desert Storm, C-130 engine maintenance was consolidated at Rhein Main AB, Germany. During ONA, intermediate F-15 avionics repair capabilities were established at Royal Air Force Lakenheath, United Kingdom.

Overview of a Global ACS System

Based on the preliminary results, an evolving ACS system to support expeditionary operations can be envisioned. The system would be global and have several elements based at forward positions or at least outside the CONUS. Figure 4 gives a notional picture.

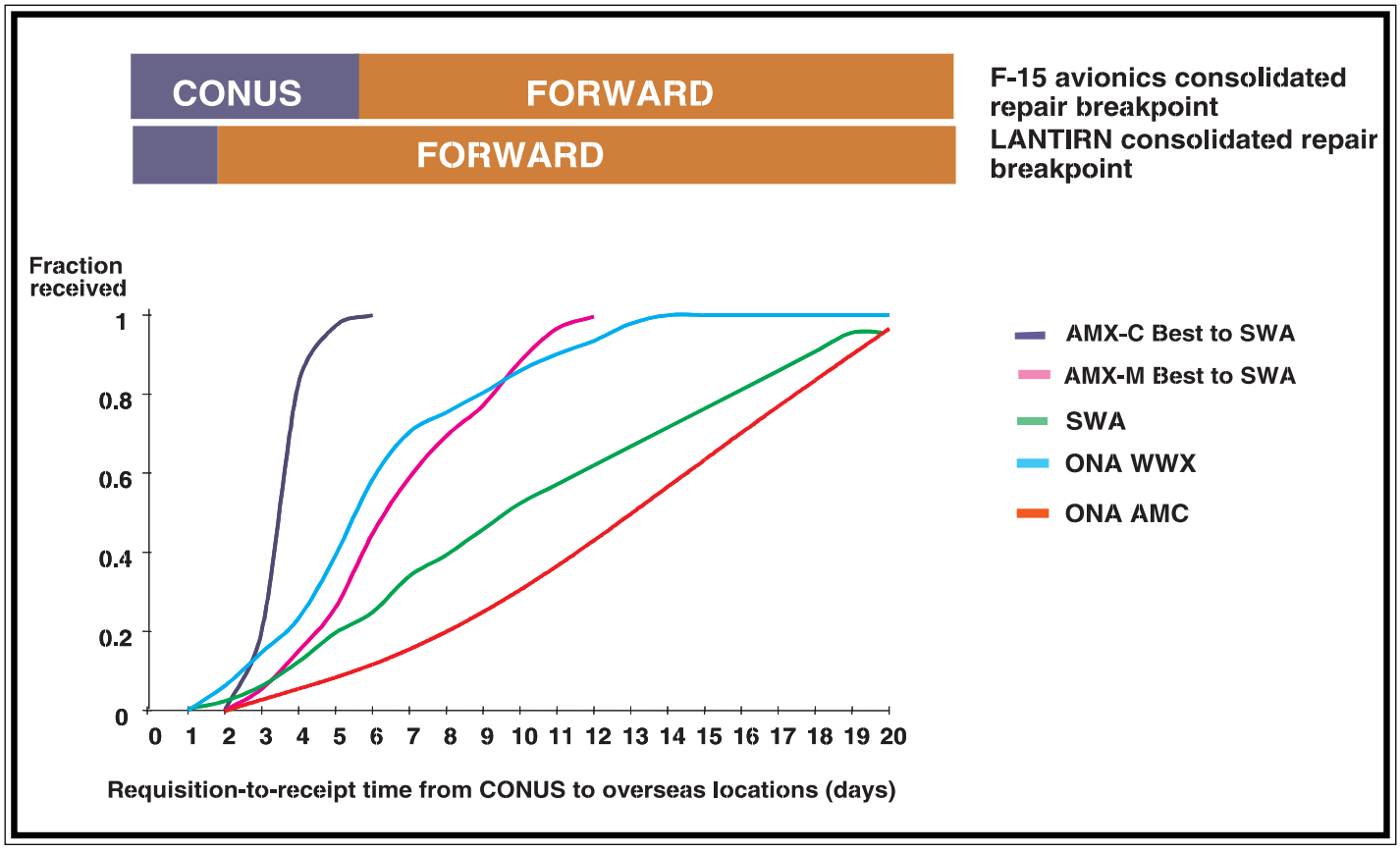

Figure 3. CONUS to SWA Resupply Times and Support Breakpoint Solutions

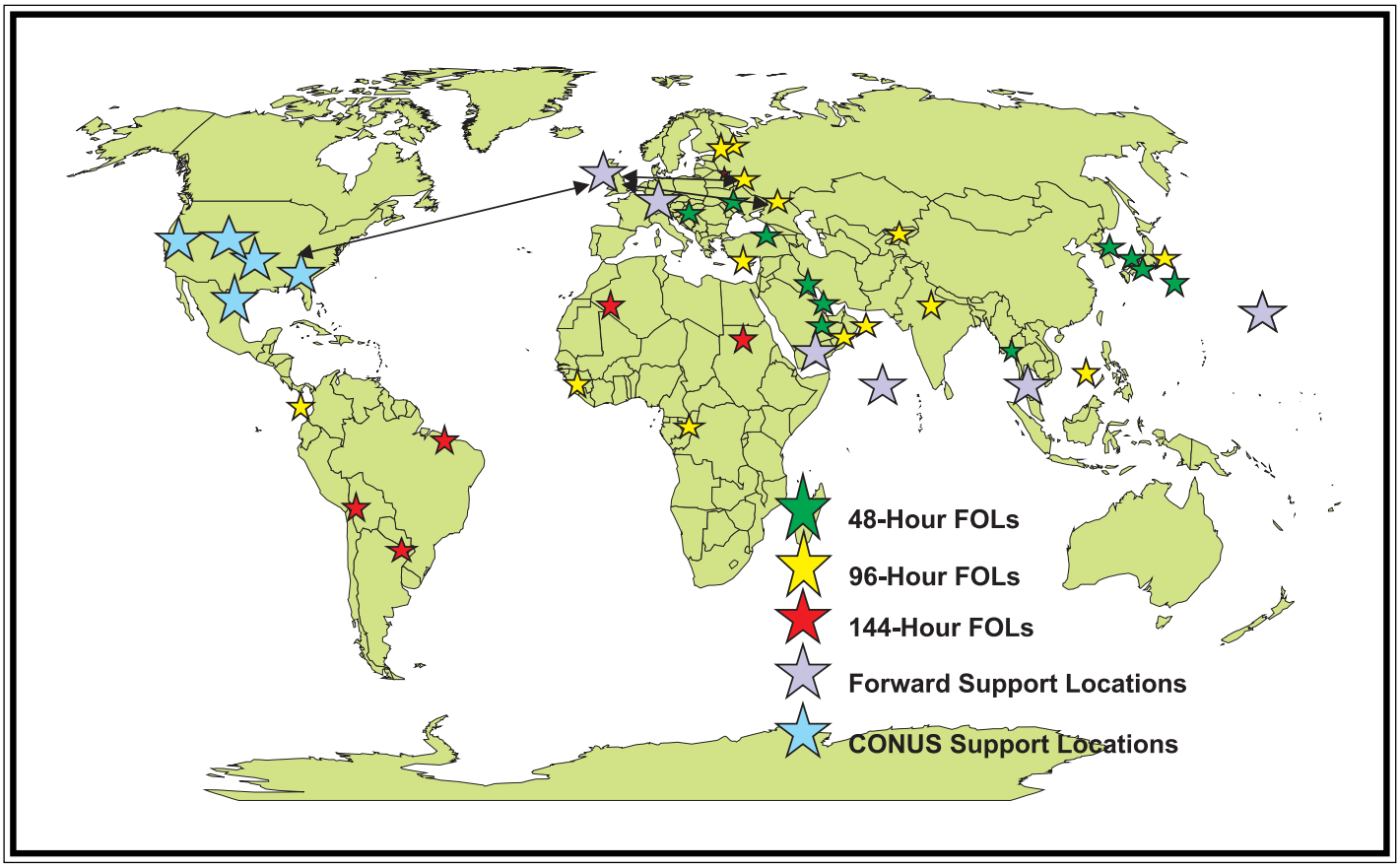

Figure 4. Potential Global ACS Network

The system has five components:

1. FOLs. Some bases in critical areas under high threat should have substantial equipment prepositioned for rapid deployments of heavy combat forces. Other more austere FOLs with longer spin-up times might augment these bases. Where conflict is not likely or humanitarian missions will be the norm, the FOLs might all be of this second, more austere form.
2. FSLs. The configurations and functions of these would depend on geographic locations, presence of threats, and the costs and benefits of using current facilities. Western and Central Europe are presently stable and secure; it may be possible from European FSLs to support operations in areas such as SWA or the Balkans.
3. CONUS support locations. CONUS depots are one type of CSL, as are contractor facilities. Other types of CSLs may be analogous to FSLs. Such support structures are needed to support CONUS forces, since some repair capability and other activities may be removed from units. These activities may be set up at major Air Force bases, convenient civilian transportation hubs, or Air Force or other defense repair depots.
4. A transportation network connecting the FOLs and FSLs with each other and with the CONUS, including en route tanker support. This is essential; FSLs need transportation links to support expeditionary forces. FSLs themselves could be transportation hubs.
5. A LOG C2 system to organize transport and support activities and for swift reaction to changing circumstances.

The actual configuration of these components depends on several elements. These include local infrastructure and force protection, political aspects (for example, access to bases and resources), and how site locations may affect alliances. The analytical framework introduced here needs to be expanded and linked with methods for taking additional issues into account. The primary focus should be on areas of vital US interests that are under significant threat (Figure 4 shows clusters of FOLs in Korea, SWA, and the Balkans).

This potential structure and the key findings depend on the current force and support processes. As new policies are developed and implemented; the Air Force gains experience with expeditionary operations; and new technologies for ground support, munitions, shelter, and other resources become available, the system will need adjustment to reflect new capabilities. Improvements in transport times, weight, and equipment reliability may favor greater CONUS support and shrinking the network of FSLs.

An analytic framework helps focus research and attention on areas where footprint reductions could have big payoffs. Munitions is a key area where reductions in weight and assembly times could pay big dividends in deployment speed. For operations at bare bases, where shelter must be established, the development and deployment of more lightweight shelters (for example, the small shelter program or AEF hotels) can also pay dividends in deployment speed and footprint. Changes in these areas will not be made immediately, but the structure outlined previously will enable expeditionary operations in the near term.

Peacetime cost is important for the analysis. The new support concept may help contain costs by consolidating assets, reducing

deployments for technical personnel, using host-nation facilities, and possibly, sharing costs with allies. Considerable infrastructure, including buildings and large stockpiles of war reserve materiel, may already be available in Europe.

Limited testing of the envisioned ACS occurred during ONA. Before the war, the United States Air Forces in Europe, Director of Logistics (USAFE/LG) consolidated WRM storage at Sanem, Luxembourg. During ONA, the USAFE/LG established consolidated repair facilities at Lakenheath and Spangdahlem. An intratheater distribution system was created to provide service between FSLs and FOLs. Munitions ships designated for use in another AOR were moved to support ONA munitions resupply. This transfer of assets between theaters raised several issues about how non-unit resources should be stored for use in multiple AORs.

ONA raises several general issues for those designing the future ACS system. Support design for ONA took time that may not always be available in other conflicts or war. Heroic efforts were required to overcome system, training, and concept of operation shortfalls. This raises questions as to what new efforts should be institutionalized in an ACS system. Some resources needed for ONA were tied to other AORs, and this leads to questions about logistics support becoming more of a strategic, rather than a tactical, asset.

Strategic and Long-term Planning for the ACS System

Building an ACS system requires many decisions about prepositioning and the location of support processes, including the categories of FOLs and FSLs. The prototype models developed and used deal with process characteristics and rough costs, but support decisions must also account for threat situations and political considerations that change over time.

Strategic planning for an ACS system must be global and evolving. A global perspective is needed because the combination of cost constraints, political considerations, and support characteristics may dictate that some support for a particular theater or subregion be provided from facilities in another region.

This is not a theoretical point. Much of SWA is politically volatile, and support there might better be provided from outside the region, as indeed, some is now from Europe and Diego Garcia. The configuration of FOLs and FSLs is critical in sizing the aircraft fleet and in setting up its refueling infrastructure to support all theaters.

Strategic planning must be evolving because the new security environment includes small, short-notice contingencies and continually changing threats. Geographic areas of critical interest will change over time, as will the specific threats within them. An expeditionary ACS system designed today would be oriented toward SWA and Korea, but within a decade, those regions could be at peace and new threats emerge elsewhere.

In addition to political changes, support processes and technologies may also change as the Air Force continues to move to a more expeditionary footing and seeks to reduce support footprints while maintaining effectiveness. Over the next 10 years, it is expected that many process and technology changes will force reevaluations of the ACS system.

The need for global and evolving planning will require centralized planning in which cost, politics, and effectiveness trade-offs are made for the system as a whole and to ensure that each theater is appropriately protected and supported. This goes against the current practice of giving each theater commander control of all theater resources. Peacetime cost considerations alone require that facilities not be duplicated unnecessarily across theaters.

Changes in the force structure will also require changes to the support structure. The F-22, for example, is designed to have one-half the support footprint of the F-15. The Joint Strike Fighter is also designed to reduce support requirements. Air Force wargames, particularly the Future Capabilities games, have experimented with radically different forces relying on standoff capabilities or space-based weapons. All of these developments will lead to changes in both support requirements and in the options that are most attractive under peacetime cost constraints.

The advantage of an analytic framework is such long-term changes can be handled in the same way as short-term modifications to policy and technology. New technologies, political developments, and budget changes require continual reassessment of the support system configuration, which we are designing our model to do. New force structures will require different support resources, in turn, requiring new support structures. For long-term decisions, the ability to perform quick-turn, exploratory analysis of different support structures becomes even more important.

Notes

1. The Logistics Transformation Team, comprising Air Force and KPMG personnel, is leading much of this transformation work. The Logistics Transformation Team was previously the Agile Logistics Team, which was previously the Lean Logistics Team. Electronic correspondence from Lt Col Michael Menendez, HQ USAF Installations and Logistics, Logistics Transformation Team, to Robert S. Tripp, RAND, 5 October 1999.
2. For a detailed discussion of how changing technology affects one part of the support system, see "F-15 Support Analysis," page 24, of this publication.
3. For a more general discussion of this point, see Robert S. Tripp, et al., 1999, "Strategic EAF Planning—Expeditionary Airpower, Part 2," *Air Force Journal of Logistics*, Vol 23, No. 3, 4-9.
4. We again direct the reader's attention to page 24 of this publication for a more specific discussion of trade-offs regarding one part of the support process.
5. This model is discussed in more detail in Tripp, et. al.
6. Air Force Materiel Command Materiel Handling Engineering Program Office Briefing, Wright-Patterson AFB, Ohio 6 July 1999.
7. See page 24 of this publication.
8. Amatzia Feinberg, et al., Supporting Expeditionary Aerospace Forces: A Preliminary Analysis of LANTIRN Options, RAND AB-293-A, Santa Monica, California, 1999.
9. Data collected from the 4th Air Expeditionary Wing deployment to Doha, Qatar, from May 1997 to August 1997. MICAP requisitions that were processed at Prince Sultan AB in Saudi Arabia averaged less than 5 days. At that time, Prince Sultan AB and Doha were connected by scheduled military resupply flights.

LANTIRN Support Challenges

Intermediate Maintenance Concepts

We have moved away from a containment strategy to one of global engagement with shaping and responding as the key words for the United States Air Force.[1] The increasing number of deployments launched on short notice to unpredictable locations presents new challenges to Air Force personnel and capabilities.[2]

This paradigm shift presents new challenges to legacy support structures and the evolving Agile Combat Support (ACS) system. Support must spin up almost immediately to sustain operations, minimize airlift demands to increase deployment speed, and have the flexibility to respond to uncertain locations and mission requirements. Concurrently, cost pressures and the personnel implications of an expeditionary force have led the Air Force to reexamine the complete ACS system in order to understand how alternative structures, technologies, and methods affect capabilities.

This article specifically examines alternative low-altitude navigation targeting infrared for night (LANTIRN) intermediate maintenance operations and explores the implications of support equipment investments in conjunction with various logistics concepts. The LANTIRN system consists of two pods (navigation and targeting) employed by F-16s and F-15Es. The alternative support structure options range from the current decentralized practice of deploying intermediate maintenance with the fighting units to a network of consolidated (or even single) support locations.

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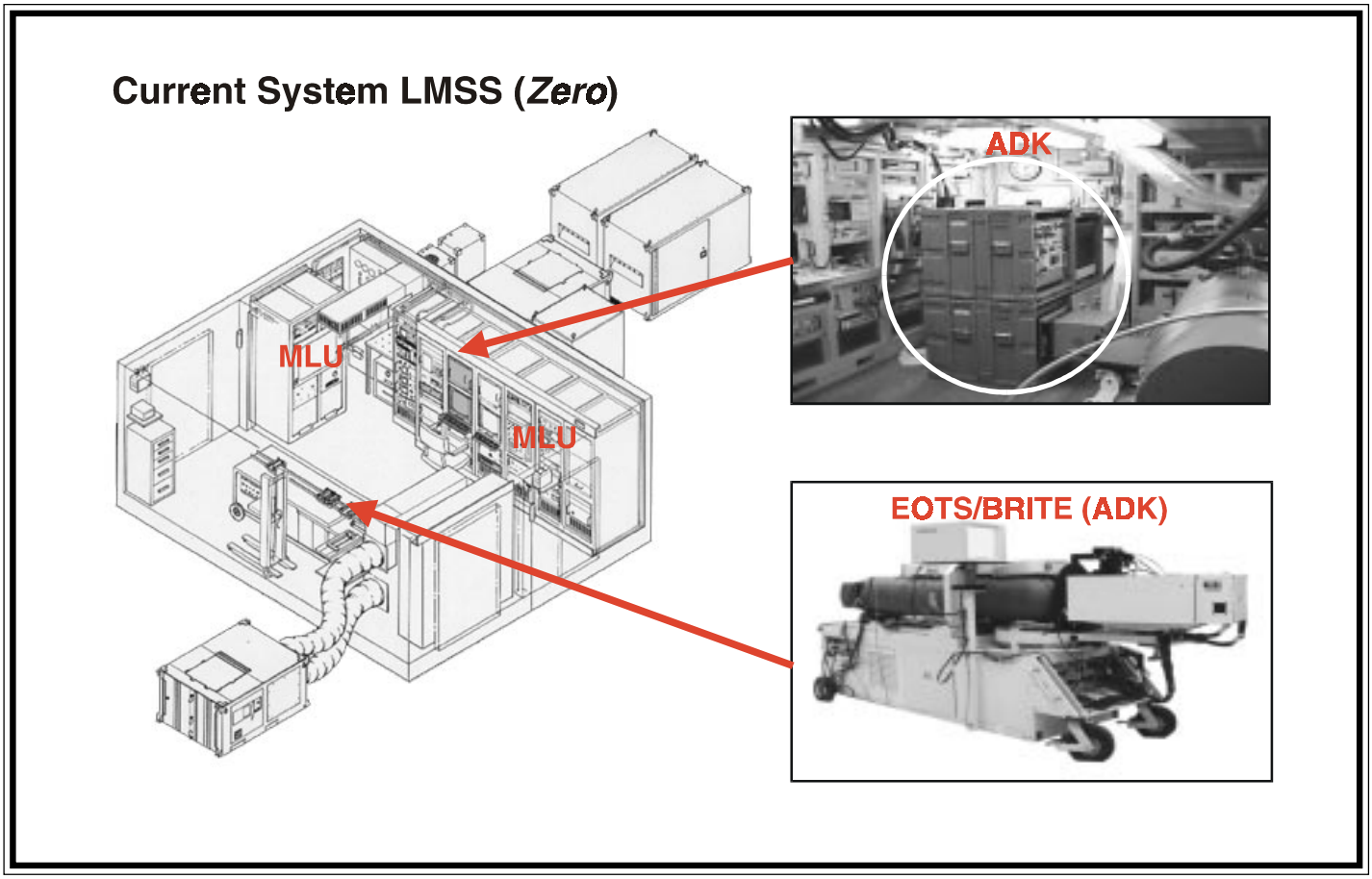

Figure 1. Current and Proposed LANTIRN Support Equipment

Support equipment upgrades, policies, and capabilities combine with these structure options to form a rich array of possibilities from which the Air Force may choose the best ACS system to meet uncertain scenarios.

Scenarios, Support Structures, and Equipment Upgrades Create the *Trade Space*

The Air Force currently maintains LANTIRN pods using a decentralized logistics structure, deploying full sets of testers from home operating bases to forward operating locations (FOL) with the aircraft. Other options rely on varying levels of consolidation. These range from using a single Continental United States (CONUS) support location (CSL) to using a CSL in network with two to four forward support locations (FSL). This analysis centers on the implications of various levels of consolidation chosen for the LANTIRN intermediate-level support operations relative to operational scenarios ranging from peacetime to two coincident major theater wars (MTW).

While structure decisions may focus on support locations, they should not do so exclusively. Adopting new procedures or technologies can affect how different support structures compare to each other in terms of capabilities and costs. While the Air Force does not plan on upgrading pod performance or purchasing additional LANTIRN pods, three investment options to upgrade the support equipment used to repair these pods—including zero investment, advanced deployment kit (ADK,) and midlife upgrade—were evaluated. The upgrades offer a reduced footprint and enhanced support equipment performance and reliability. The current intermediate-level LANTIRN mobility shelter set and proposed upgrades are shown in Figure 1.

During the study, expected warfighter capability levels relative to a range of deployment and transportation times were computed by combining scenarios, support structures, and investments. Additionally, system cost implications—in terms of equipment, spares, and infrastructure investments, as well as transportation and labor expenditures—over a 15-year time horizon, the expected life of the program, were assessed. Analysis showed that the decision to centralize or decentralize LANTIRN repair operations hinges not on the expected system costs but on the capability and risk levels the Air Force is willing to accommodate in its operational plans.

Analysis of the Fundamental Factor—Time

When weighing the implications of centralized or decentralized support, one must consider the deployment and inter/intratheater transportation times associated with each option. Whereas forecasting this time element for MTW scenarios is difficult, the expected capability levels relative to a range of both deployment and transportation times were assessed. Figure 2 illustrates the results of targeting pod analysis for a two-coincident MTW scenario. Only the targeting pods are shown since they are more

mission essential and generate greater demands on the maintenance system.

Given the inherent pod inventory constraint, a pod availability goal was set for both engaged and nonengaged aircraft. Availability is defined as the number of serviceable pods available for use on aircraft for specific missions. Since the Air Force currently does not have a specific availability goal for LANTIRN pods on aircraft, a value (80 percent) somewhat higher than that used for the entire aircraft fully mission-capable rate was chosen.

Next, the expected pod availability for the nonengaged aircraft (trainers) was computed as a function of deployment or transportation time. Deployment time was defined as the number of days it takes repair to set up functional operations at the forward operating location once surge missions begin, in other words, the number of days *after* flying begins when repair comes on line. If deployment takes longer than 7 days during the second MTW, there will be no pods available to fly training missions. Furthermore, if deployment times increase beyond this breakpoint, then the Air Force will risk degrading pod availability to the *engaged* aircraft.

The centralization options introduce a different time factor in the analysis. Now, transportation time (defined as order and ship time [OST]) becomes the critical system sensitivity. Since equipment and some people are prepositioned near areas of potential conflicts, deployed units must transport unserviceable pods to the regional repair operation. Again, the targeting pod availability was computed during the second MTW as a function of the one-way transportation time from an FOL to a regional repair facility. Here, the critical breakpoint is 5 days, beyond which *engaged* aircraft capabilities may degrade.

Structure Tradeoffs

Strategic and Operational Risks. While centralized operations may be more susceptible to terrorist attacks or may be located too far from yet unforeseen contingencies, the decentralized support structure is extremely sensitive to the availability of deployment airlift during the early phases of large-scale missions. Both structures may suffer if resupply times do not meet the performance assumptions used to set spare parts levels. Operationally, a decentralized structure is very sensitive to tester downtime. If a single set of testers is deployed, a breakdown by just one will temporarily eliminate repair capabilities. In a consolidated structure, the greatest operational risk is OST. The severity of the effects of subpar performance depends upon how actual resupply time differs from the assumptions used to plan readiness spares packages and pod kits for a specific deployment package.

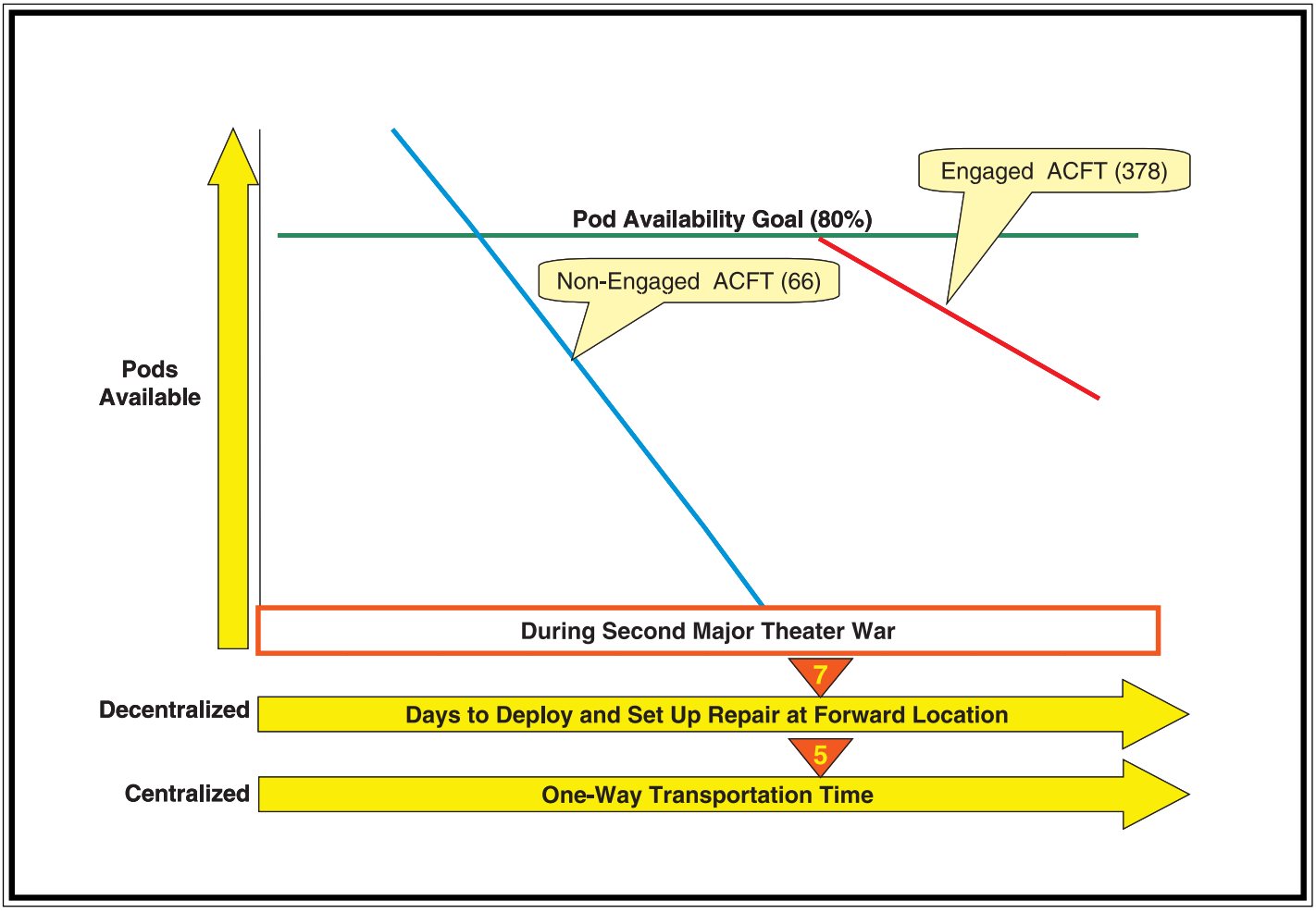

Figure 2. Expected Pod Availability Relative to Deployment or Transportation Time

Deployment Footprint. Among the goals of the Expeditionary Aerospace Force are quick-hitting expeditionary operations and deployment predictability to improve stability in the personal lives of Air Force personnel. These goals require rapid deployment of strong combat forces, putting a premium on reducing footprint or the amount of initial airlift space needed to transport operating materiel and combat equipment. While consolidation options may reduce the number of people needed in regional operations by up to 150, requiring smaller personnel deployments (under 60), the greatest footprint reduction is realized through the elimination of equipment movement. Conversely, decentralized support of a two-MTW contingency would require movement of 85 to 252 people and more than 180 equipment pallets, depending on upgrade investment.

Organizational Issues. Although the thrust of this analysis focuses on the quantitative issues associated with various logistics structures, one cannot overlook the less tangible cross-organizational implications of the dipole options space. Decentralized support requires that individual squadron or wing commanders compete for valuable airlift early in the campaign. This includes competing not only with other LANTIRN units but also with other commodities. As a result, mobilization plans may need to be modified to prioritize deployment time lines. While centralized support requires minimal tactical airlift (pods are relatively small), commanders would have to share a global asset pool. This pool includes not only personnel and repair equipment but also tactical transport and the pods themselves.

Support Option Advantages and Disadvantages

While the centralized option requires fewer test sets and fewer highly skilled personnel, the annual transportation costs may be higher. The analysis shows that these annual costs, coupled with labor expenses, are virtually the same across the seven options analyzed. So the recurring peacetime costs and, consequently, present value of *all* costs are essentially equal, as shown in Figure 3.

Another advantage of the regional support structure is the drastically reduced deployment footprint. Specifically, very few people need to deploy to support the two MTWs. Furthermore, since FSLs are removed from theater operations, both the support equipment and people face lower risks. Although regional operations may become more vulnerable to attack (both conventional and cyber), proper preparations and communications design can alleviate these threats.

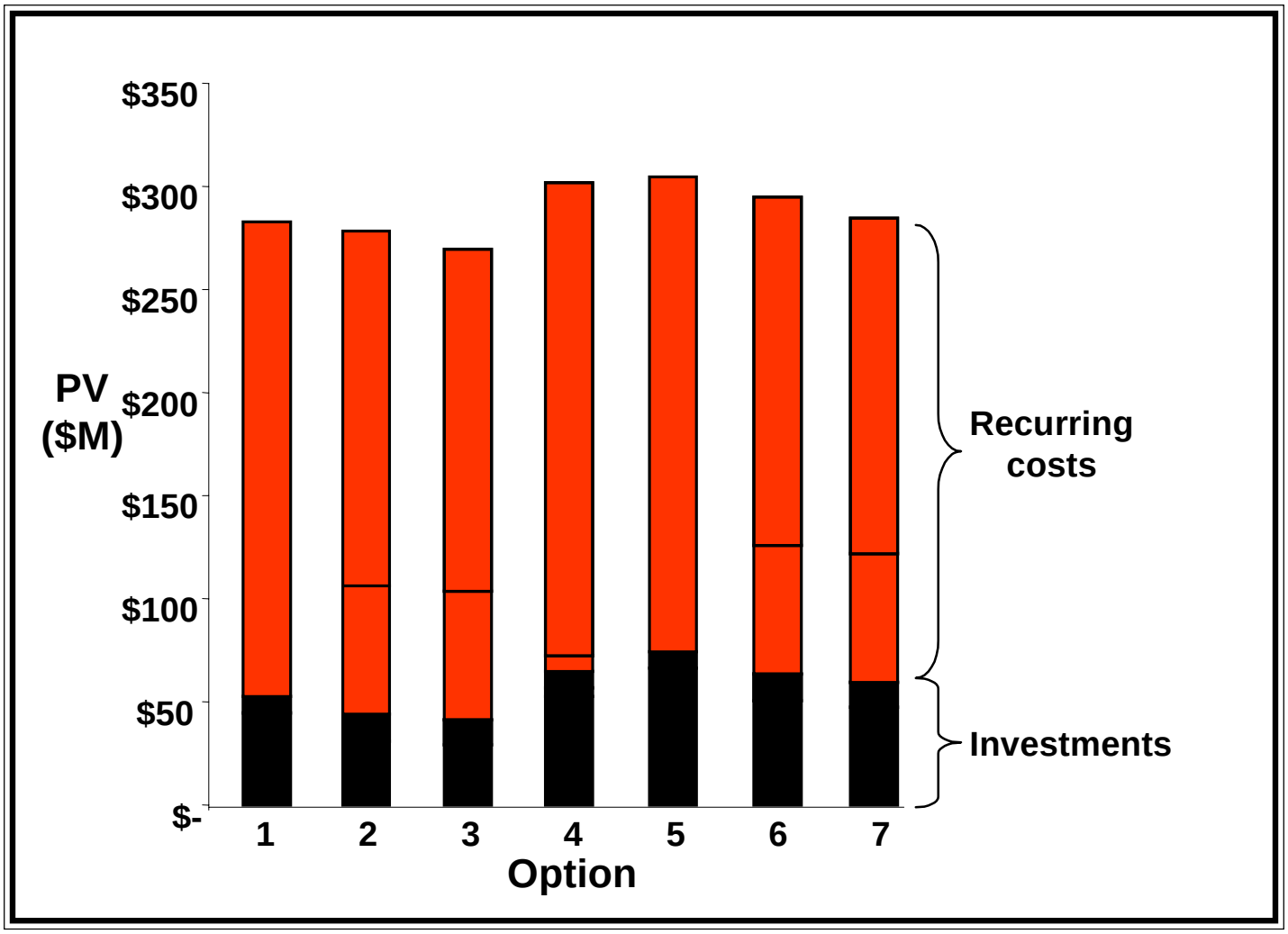

Figure 3. Present Value of Investment and Recurring Costs by Option

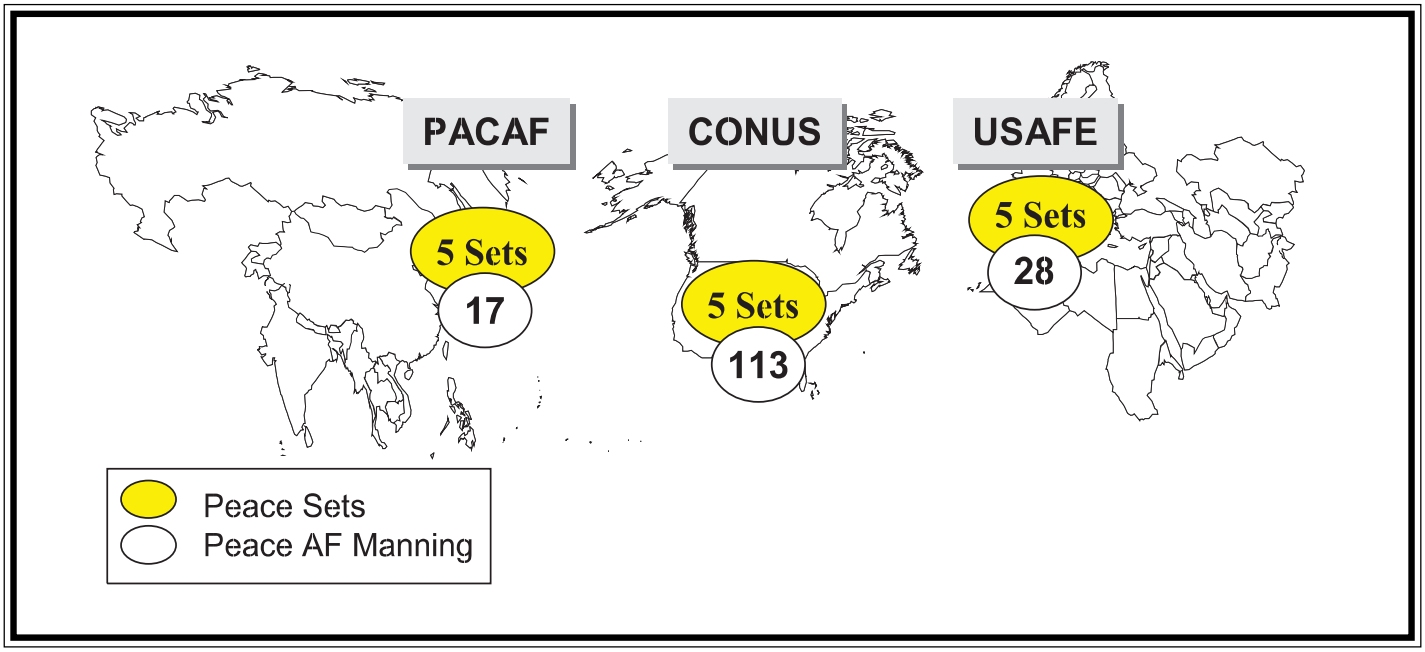

Figure 4. Notional Breakdown of Equipment and People for a Regional Repair Structure

Colocation of test equipment not only reduces the effects of single-string failures but also eliminates the need to transport repair equipment to support various contingencies. Since test set transport and setup times can be quite long and equipment readiness is unpredictable once it is unloaded in theater, the regional structure offers a much more stable support system. However, daily pod transportation risks increase with the consolidated options. Since pods must be moved off base for repair, the system's sensitivity to transportation delays is amplified. Pods will pass through additional transportation channels, and more people will be involved with the loading and unloading process. While there is no data indicating pod sensitivity to transport, rough handling in the new channels may become an issue in the proposed regional structure. Standardized training procedures and tools can mitigate this potential problem.

The analysis also shows that the decentralized structure requires greater support equipment investment, thus increasing the financial risks to the Air Force. However, the present value analysis indicates that, in the long term, recurring costs outweigh investment costs, making the financial difference between the seven options negligible.

Most important, the consolidated intermediate repair structure will require new organizational processes. Unit commanders will have to relinquish some of their control over LANTIRN pods. They will also have to communicate very closely with the support centers and other bases serviced by the same regional facility. Performance metrics and incentive systems may also need to change to support a system focused on customer (warfighter) satisfaction, on-time delivery, and quality workmanship.

Conclusions

Analyses show that—given today's planning scenarios and deployment and transportation processes—the Air Force must invest in support equipment upgrades regardless of support structure. Furthermore, centralized support exclusively from CONUS facilities may reduce warfighter capabilities due to extended pipelines. Thus, it can be asserted that in assessing centralized repair alternatives, the Air Force should only consider networked FSL and CSL structures.

While the FSL structure introduces new risks to the Air Force, it also offers some distinct advantages over the current system. The most viable structure the analyses identified would use two FSLs and one CONUS facility. Figure 4 shows a notional implementation of such a structure with five prepositioned sets in each region and the peacetime manning indicated in the white bubbles.

This system requires that pods be shipped from FOLs to the centralized repair facilities. While this analysis was based on Defense Planning Guidance flying program expectations, other mission profiles (like Operation Noble Anvil) may change the resource requirements. However, since the options analysis focused on relative differences, the overall strategic outcomes would not change.

Based on the analysis, the Air Force should invest in the ADK upgrade and conduct a proof-of-concept experiment of the regional repair option. However, a centralized system will be sensitive to transportation times and may suffer from poor cross-organizational cooperation and communication. Viable locations to conduct this test include Aviano AB, Italy; Royal Air Force Lakenheath, United Kingdom; or another US Air Forces in Europe installation. This test offers an opportunity to assess transportation system capabilities (and shortfalls) in an international environment and with more stringent operating tempos than within the United States.

Notes

1. Gen Michael E. Ryan, "Air Expeditionary Forces," DoD Press Briefing, 4 August, 1998.
2. _____, "Aerospace Expeditionary Force: Better Use of Aerospace Power for the 21st Century," Briefing, Washington, DC: AQ, USAF, 1998.

Air Force Deployments and Support Services Contractors

Running Out

# of Gas?

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The growth in use of contract services by the Air Force has become a matter of genuine concern . . . focused particularly on what missions and jobs the Air Force has, plans, or should perform with military and civilian personnel versus what missions and jobs have been, can, and should be performed by contract services.

General Curtis E. LeMay, Vice Chief of Staff
Letter to Deputy Chiefs of Staff, 6 October 1958

Concerns over the proper use of private sector contractors for military support services are not new. In fact, the US military has employed the private sector in these activities since the Revolutionary War.[1] Today, the Air Force faces major budget and personnel constraints and will continue to do so for the foreseeable future. The unwillingness of the American public or Congress to fund military programs at the levels requested by the Services makes maximizing current and future funding a top priority. One key tool for the Air Force in this continuing struggle is the use of competitive sourcing (CS). Under CS, functions not considered inherently governmental or core are competed with the private sector. The intent of this process is to reduce costs and improve efficiency.

Competitive Sourcing Concepts and Definitions

In 1996, the Defense Science Board Task Force defined outsourcing as "the transfer of a support function traditionally performed by an in-house organization to an outside provider."[2] This is in contrast to privatization, where facilities, equipment, and other government assets are usually transferred. Most of the actions taken in the support services arena examined herein involve competitive sourcing (the term used to describe both outsourcing and privatization) of existing activities or the use of the private sector to supplement existing military capabilities. According to *Office of Management and Budget (OMB) Circular A-76* (the federal government-wide document used as guidance on most outsourcing actions), only those activities considered commercial activities—defined as those "resulting in a product or service that is or could be obtained from a private sector source"—can be

competed.[3] Inherently governmental functions, defined as "so intimately related to the public interest as to mandate performance by federal employees (including military personnel)" are not to be competed with the private sector. This determination is based on several factors, including levels of required government control and oversight.[4] The *Circular* also delineates several categories of commercial activities excepted from competition, including national defense activities, defined as "a commercial activity . . . being subject to deployment in a direct military combat support role."[5] Department of Defense (DoD) and Air Force guidance closely mirrors the *OMB Circular A-76* language.[6]

Air Force Priorities

Air Force goals in the competitive sourcing arena are ambitious, place a greater focus on core activities, attempt to improve performance and cost effectiveness, generate savings for modernization, and maintain readiness.[7] CS actions have generally been successful in cost and personnel reduction. Figures from early 1999 indicate Air Force manpower savings in actions competed under *OMB Circular A-76* during the 1990s averaged 36 percent.[8] Unfortunately, problems with such savings arise from the primary and secondary consequences of increasing private sector involvement in Air Force support services. These consequences include the risks associated with disrupting mission capability and activities and the inability to adequately perform during critical periods—initial deployment or mission sustainment. The number of Air Force military and civilian positions currently considered eligible for a public/private competition is, however, relatively low. According to 1995 Air Force data, out of a total military and civilian employee base of just under 600,000, about 309,000 positions were considered to be performing commercial activities. Of these positions, about 49,000 were considered eligible for competition based in large part on national defense or deployability exemptions.[9] The Air Force expects to reduce its total fiscal year 1998 end strength of 544,000 by subjecting at least 54,000 additional positions to competitive sourcing initiatives by fiscal year 2005.[10]

Air Force criteria for determining which functions may be subjected to public/private competition begins with the total baseline population. The Air Force then subtracts individuals in deployable unit type codes (UTC); all rated and medical personnel; certain other forward-based personnel; the Continental United States (CONUS) rotational pool for overseas presence; and other military essential, inherently governmental positions or those not subject to contract because of statutory restrictions.[11] The more detailed decision criteria cited touch on a key concern. The Air Force, in its efforts to meet ambitious outsourcing and cost-savings goals, is using criteria that do not always examine what effects competitive sourcing current functions may have in other areas and may not always be consistent in applying them. For example, regardless of their criticality to military effectiveness, individuals assigned against a deployable UTC are exempted, thus forming a large pool of *untouchable* positions, regardless of criticality to military effectiveness. The effect of competing those activities eligible for outsourcing on deployment effectiveness, however, is not addressed by a specific criterion. Evidently, these activities must not be considered direct combat support or otherwise militarily essential positions.

This problem leads to an acknowledgment of the need for a clear delineation of what functions are core—those considered *direct military combat support* activities. While this question initially seems simple, the analysis can become complicated. Contractors already provide flight-line mission support for certain combat aircraft in theater on the flight line. Personnel providing support in supply, transportation, repair, and maintenance in country may well be considered to be providing services directly related to combat support, but the line is not clear, and the definitions become fuzzy.[12] Maintaining competition exemptions for all UTC-deployable functions presently filled by military personnel is the Air Force's current position, but the continuing drive for cost containment may make that position untenable in the future.

Current Status of Air Force Fuels and CE Support Functions

Air Force fuels and civil engineering (CE) support functions provide some illustrative examples of the potential problems arising from CS actions. Currently, both of these functions are either considered for—or are already being subjected to—public/private competition on an extensive scale in CONUS locations. Civil engineering and supply (including fuels activities) are approved CS processes targeted to achieve overall Air Force reductions cited earlier. The Air Force plans to subject more than 7,000 civil engineering and almost 4,000 supply positions to competition.[13] A review of current data indicates fuels functions at more than ten locations, involving more than 500 positions, have been subjected to competition. In the Air Education and Training Command and Air Force Materiel Command (AFMC) alone, more than 2,000 CE positions are currently being reviewed as candidates for further outsourcing.[14] In light of the imperative to cut costs and manpower, CS actions in the fuels and CE support arena are not surprising.

Fuels activities are generally assigned to supply squadrons in separate fuels flights. These flights manage the requisition, receipt, storage, issue, quality, and accounting of all petroleum fuels and cryogenic products.[15] A CONUS-based or deployed fuels management flight generally has responsibility for fuels operations (control, distribution, and storage of fuels, propellants, and cryogenics), as well as quality control and inspection, accounting, training, and mobility.[16] In Air Force operational commands, fuels support activities generally tie directly into or interface on a regular basis with other key operational functions, including operational support, contracting, transportation, and CE squadrons.

Since 1993, responsibility for managing the Air Force fuels infrastructure and the general provision of fuel has been divided between the Air Force and the Defense Logistics Agency's (DLA) Defense Energy Support Center (DESC) (formerly the Defense Fuel Supply Center). Today, DESC is responsible for renovation or major maintenance, repair, and environmental expenditures related to fuel operations worldwide, as well as new construction. The Air Force is responsible for minor maintenance and fuel operations at existing installations and tactical fuel operations. In addition, DESC owns all DoD fuel until it is dispensed to mobile equipment, such as ships, aircraft, and ground vehicles.[17]

The fuels career field currently employs around 3,500 people, with the vast majority being active duty Air Force personnel. From this field, the Air Force staffs its temporary overseas commitments (Southwest Asia, for example) and operates and maintains its CONUS installations. The current Air Force operations tempo has resulted in several hundred of these fuels specialists being in temporary duty status overseas on any given day.[18] In addition, as the Air Force moves into fully staffing the Air Expeditionary Force squadrons, fuels support personnel are *embedded* in each of the expeditionary units.[19]

Efforts to subject this function to significant competitive sourcing or privatization are ongoing. In 1998, the Department of Defense contracted with the Logistics Management Institute (LMI) to assess the potential for privatizing fuel infrastructure at military installations. LMI reviewed five sites in detail (including all three Services) and, in October 1998, provided a report with four alternative strategies for attracting the private sector to the DoD fuels arena. These strategies included accepting a private firm's services on DoD assets in return for a portion of the fuel product (*product plus tariff*), shared use, bundling of several DoD assets to promote privatization, and exchange of land for real estate.[20] All these alternatives involved private sector operation of the fuels support activity. The report concluded, "DoD should consider privatizing the fuel infrastructure at sites where it is financially advantageous."[21]

The Deputy Under Secretary of Defense for Logistics tentatively endorsed this conclusion in July 1999, with privatization of CONUS fuels infrastructure to be pursued, where appropriate, on a test basis before the end of 1999.[22] During fiscal year 1999, the Air Force analyzed two locations for carrying out these privatization tests: Nellis AFB, Nevada, and Hickam AFB, Hawaii. Both bases, despite being identified as high-priority sites in the LMI study, were rejected for immediate privatization because of the fear of added loss of trained active duty fuels support personnel and construction financing issues, respectively.[23]

In addition to this activity, staff from the Office of the Deputy Under Secretary of Defense for Logistics proposed the transfer of responsibility for all CONUS, Alaska, and Hawaii fuels operations from the Services to DLA in fiscal year 2001. This proposal included the transfer of all civilian fuels and fuels-related employees to DLA, with all military personnel to be phased out of day-to-day operations over a 3-year period beginning in 2001. DLA would "give priority to providing the lowest cost operational mix of commercial and civil servant work force based on economic analysis, within the constraints of civil service manpower billets transferred to DLA."[24] While this initiative was rejected after stiff opposition from major military commands, the proposal was symptomatic of the level of frustration felt at senior DoD levels over the pace of fuels outsourcing/privatization.[25]

Most active duty CE personnel are assigned to separate CE groups or squadrons, with duties including fire protection, power production, operations, and utilities.[26] CE personnel are also organized by teams for deployment as part of Prime Base Engineer Emergency Forces (Prime BEEF) and/or RED HORSE (Rapid Engineer Deployable, Heavy Operations Repair Squadrons Engineer) teams for heavy construction.[27] In light of their involvement in base construction and maintenance, CE activities interact with most Air Force base operations when in the CONUS or deployed.

Considering its CE support requirements, the Air Force has attempted, throughout the downsizing and draw down initiatives of the last several years, to ensure its CE deployment requirements are met. As noted previously, positions considered deployable are not currently subject to outsourcing, although the Air Force basically staffs its CONUS bases using both installation requirements and potential deployment requirements.[28] Only those positions considered nondeployable would be subjected to outsourcing competitions. Based on Air Force guidance regarding implementation of *Defense Reform Initiative #20* (a DoD document providing guidance on what should be considered inherently governmental or otherwise exempt from competition), there are virtually no CE positions under current coding that could be competed. If contractors are brought into a deployed location, they are used as additional resources for mission sustainment, not to replace existing military positions. The opening of a *bare base* is still considered a job for the active duty Air Force CE component. In light of the pressures involved and the commercial alternatives available, however, this practice may not continue to be the standard.

While efforts to keep deployable positions considered essential exempt from CS consideration have generally been effective to date, there are already stresses in the system. For example, the fuels career field is already approximately 130 active duty personnel short of its desired level, based on current staffing levels and the number and intensity of overseas deployments.[29] Nevertheless, the perceived need to meet the cost and manpower targets cited have driven proposals to make deeper cuts.[30] This process could result, if pressures to cut costs and manpower do not ease, in reducing numbers of active duty personnel to a level that, even if contractors take over many services, may endanger mission effectiveness.

Support Service Contractor Performance Questions

Responsive support service contractor performance is a key requirement of the component commander, especially when military operations or combat begins. The criticality of such support goes without saying. The Air Force cannot meet mission requirements without timely, effective support, and the inability of a contractor to perform raises serious concern. For example, in a 1997 deployment, a fuels supply contractor promised adequate fuel deliveries from local sources at a base in Bahrain, where part of the Air Expeditionary Force was to be based. Immediately before deployment, the local contractor notified the Air Force it would only be able to supply about one-third of the required fuel. US embassy involvement was required to obtain the necessary fuel to fill the gap.[31]

Continued downsizing and outsourcing has resulted in a force with little additional capacity to fill in if contractors are not present. The DoD Inspector General found in a June 1991 audit, "If contractors leave their jobs during a crisis or hostile situation, the readiness of vital defense systems and the ability of the Armed Forces to perform their assigned missions would be jeopardized."[32] That statement was made when 1 American in 50 deployed to the Persian Gulf was a civilian; the Bosnian

conflict included civilians at a rate of 1 in 10.[33] By 1998, the US military force commitment in Bosnia as part of the SFOR (stabilization force) was capped at 7,800 personnel. One study estimates the number of contractor personnel (both US and local nationals) exceeds the number of deployed military forces.[34] A contractor's ability to provide surge capability is a critical factor in how successful a private firm's performance will be measured. However, requiring a contractor to maintain a surge capacity for performance may be looked upon as inefficient excess capacity, costing the government dearly in peacetime.[35]

A March 1999 Air Force Inspection Agency (AFIA) report addressed many of these issues. The report included findings that the status of contractor persons as combatants or noncombatants under international law when deployed with military forces and the ability of the component commander to keep contractors performing in combat conditions were not yet resolved.[36] While most contractors have stayed and worked in previous combat and near-combat situations, there are currently no requirements beyond contractual terms to keep a contractor and its employees in the field should combat occur.[37] Recent analysis of this problem seems to indicate the military, in light of its dependence on these contractors, will have no other alternative than to accept and try to minimize the risk of contractors choosing to leave.[38] If these personnel leave in significant numbers, the military will not be able to handle the load on its own, and core warfighting abilities and military personnel safety will be threatened.

A more insidious threat to US military capabilities in a contractor-rich, deployed environment is the potential for corporate blackmail. This threat could be directed against multinational corporations or US companies whose primary or subsidiary operations and personnel support DoD deployments. In the future, the Department of Defense could be faced with key contractors deciding their personnel will not deploy or will be withdrawn from a deployment based on threats against worldwide corporate interests. Corporations with multinational interests may decide the loss of a DoD contract is less of a business risk than the loss of more vital business interests or personal safety in other areas. A potential adversary's ability to disrupt or delay the military's ability to project and sustain forces by successfully threatening US corporate interests directly supporting those forces, may prove to be a troubling Achilles' heel in the coming years.

Contractor Personnel Protection Concerns

Contractor employee force protection, particularly in light of increased private sector support services, is another troubling issue. Most support service contractors cannot provide rear area security and rely on the military for force protection. This leads to resource and mission problems for the military:

> Force protection people are a scarce commodity. Often at overseas locations, other support personnel augment the force protection personnel. The Khobar Towers after action report even recommended the use of other (non force protection) personnel to augment the force protection mission. As military support forces are privatized, the resources for augmentation of the security forces dwindle . . . .[39]

This problem is exacerbated by the expansion, through potential opponents' weapons systems, of the battle line. For example, conventional weapons, such as long-range artillery and missiles on the Korean peninsula and in Southwest Asia, extend the hazard for private sector personnel to at least 53 miles behind the battle line.[40]

Increased private sector support services usually also result in an increase in the local national population hired to support US deployments. For example, under the initial logistics civilian augmentation program (LOGCAP) contract awarded to Brown & Root, the local national contingent at times numbered about 13,000-14,000, with a US or expatriate contingent of about 1,700 leading and supervising their operations. These foreign nationals were initially screened by checking with the local police. Those who passed this screening were placed under 100 percent surveillance by US or expatriate personnel during working hours.[41] If similar practices are followed on subsequent support contracts, persons who sympathize with actual or potential adversaries may be allowed into US military facilities until more extensive security checks are completed. This problem becomes more acute as the ratio of military and civilian personnel on deployments continues to narrow and surveillance is limited when US contractor personnel are restricted to specific bases or locals because of heightened threats. For example, after the US embassies in Kenya and Tanzania were bombed in 1998:

> . . . unarmed personnel [contractors] were restricted to the bunkers unless escorted under arms to other locations. *Contract supervision for 75 days was severely restricted to nonexistent*. Military forces were also taken off the line to perform escort duties for unarmed DoD civilians and contractor personnel.[42]

As cited by the AFIA:

> It must be assumed that LNs [local nationals] pose a significant overt or covert risk to the deployed forces. As the number of contractor personnel increases so must the government oversight. *Outsourcing 10 support positions does not mean that 10 more military forces are available to support mission requirements.* The increases in support positions are not only QAEs [quality assurance evaluators] but also personnel involved in force protection [Emphasis supplied].[43]

In prior conflicts, the risk incurred from one or a few local nationals being unsupervised or having minimum security checks would have been relatively low. However, today, the ability of one person to sow biological or chemical weapons through a densely populated US military encampment presents perhaps too high a risk.

Cost Concerns

A key factor in moving support functions toward public/private competition is the generally accepted assumption that competition of such processes with the private sector leads to substantial savings for the government. While the potential savings may vary between analyses, cost savings of approximately 30 percent are considered typical.[44] This cost-saving assumption generally focuses on the private sector's ability to control wages, the need to pay for military or federal civilian pension and other benefits, and the multiskilled performance flexibility attributed to private sector employees (particularly when compared with often unionized federal civilian employees). Other sources measuring private industry outsourcing do not find the level of savings cited, but reductions

of about 9 percent, with corresponding increases in capacity and quality, can be found.[45]

Other factors not necessarily included in this assumption of cost savings, however, should be taken into account. While many military service functions may be identified for competitive sourcing based on the availability of the same or similar private sector services, the cost savings in such areas, measured in actual cost performance after contract award, may not be so clear. The downstream cost-saving question was addressed in a December 1996 analysis of facility management costs at Naval Air Stations (NAS) Fallon, Nevada (contractor-provided), and Miramar, California (government-furnished), for fiscal years 1992 to 1996. Taking into account regional cost and requirements differences, the study found that out of nine facility management areas studied, only three showed significant savings from contractor services. One area had similar costs, and five areas were "significantly cheaper at NAS Miramar using in-house forces."[46] The study concludes:

> In summary, any blanket statement that outsourcing is cheaper is not always true. Careful studies are needed on a case-by-case basis before deciding which functions to outsource. Cost savings are achievable through outsourcing, but they are also achievable by using in-house forces.[47]

Concerns about downstream contractor costs are not limited to facilities contracts. The LOGCAP omnibus support services contract is another instance where cost data can be interpreted differently. The public pronouncements on the success of the contract are widespread and generally accepted, with savings of $140 million dollars being cited.[48] Other reports, however, refer to Army concerns that it is paying too much for these services—the contractor in Bosnia exceeded the first year precampaign planning estimate by more than $110 million—even while expressing satisfaction with the contractor effort.[49] Prior federal outsourcing contract studies indicate that, while cost savings in the 20-30 percent range are predicted, these savings are often based on initial estimates rather than long-term savings. The actual savings are often considerably lower or, in some cases, nonexistent.[50]

Another part of the total contract cost calculation must take into account added costs taken on by the Services (for example, force protection and other types of support for contractor personnel) when using the private sector during deployments. Private firms currently enjoy fairly low training costs when providing these services, as they often employ former military personnel who have the training, security clearances, and other attributes that allow them to quickly meet contract requirements. Hiring these personnel today reduces the private sector's training and security clearance costs. As the Department of Defense continues to downsize and outsource, these costs are almost certain to rise. All these considerations taken together will almost certainly reduce actual cost savings when the Services use deployable contractor support services.

Careful choices must be made and detailed market analyses used when determining whether a deployable function deemed *commercial* should be subject to competition, using the actual total costs of private sector performance (including the factors cited). This review should also take into account whether reengineered military organizations could produce similar cost savings, especially if statutory and regulatory barriers to such actions are removed.[51]

Continuing defense budget reductions may well result in a lower overall potential for a robust, competitive marketplace for certain types of military service support contractors. If this market does shrink and the number of contractors diminishes, the ability of these contractors to make an acceptable market profit will diminish without the higher prices paid by the military. In combination with the emerging preference under procurement reform initiatives for extended contract periods, close cooperation between contractors and the government in drafting performance requirements and the eventual reduction in the military's organic ability to perform these functions, continued CS actions could result in the DoD substantially subsidizing the private sector's ability to provide these basic services. Using competitive sourcing to take advantage of perceived short-/medium-term cost savings may result, over the long haul, in more expensive contractor-provided support services.

Active Duty Force Concerns

The downsizing efforts of the last 10 years have cut into the number of people available for duty in support services and has contributed significantly, along with an overall increase in the number of deployments, to an increase in operations tempo for active duty support personnel. The use of outsourcing as a way to mitigate the effects of such downsizing and stretch the military's ability to cover missions has worked to a degree, but limitations in the application of this solution may be coming to the fore.

If the impetus for outsourcing these functions continues, the Air Force will have to be concerned about the loss of a trained pool of military personnel. Once the Air Force outsources such functions, there will be little opportunity to retain these skills in house. There is no assurance as these functions are relinquished that the Air Force will be able to maintain its technical proficiency in these areas or that contractors will retain an adequate knowledge base (at least without substantially increased training costs), especially when short-term contracts (less than 5-year base periods) are used. One solution to this problem is to simply exclude certain key functions from competition, as the Air Force did in excluding about 100 of the more than 600 CONUS utility systems under review. The Air Force rationalized that these facilities must be run by military personnel to ensure CE units are properly trained and can perform their duties in a deployed environment.[52]

Another concern is the need to ensure a place for deployed active duty personnel to *come home to* if base support services continue to be outsourced. If, for example, CS actions result in CONUS support operations being increasingly performed by contractor personnel, deployed active duty personnel in those functions may find their roles usurped by the private sector upon their return. This could result in the active duty force being required to be more multiskilled to cover different specialties not subject to contracting out—not a bad result on its face, if training and experience in applicable specialties can be maintained. The other result might be, however, that as active duty military personnel are increasingly relegated to military essential, deployable activities, these people may find deployments steadily increasing, with even greater negative impacts on force retention and morale than those experienced today. Such concerns dictate a corporate rethinking of the existing system to ensure mission demands are met.

The Contractor Management/ Integration Imperative

A key problem in this arena is the Services' lack of comprehensive planning to manage and integrate private sector support contractors in a deployed environment. In fact, there is no evidence the Services can even centrally track contractors in any particular deployment or even their reason for being there. In 1991, the DoD Inspector General (IG) issued a report that included statements that the Department of Defense had;

> . . . no capability to ensure continued contractor support for emergency-essential services during mobilization or hostilities, no central oversight of contracts for emergency-essential services, no legal basis to compel contractors to perform, and no means to enforce contractual terms.[53]

The DoD's responses to this IG report sidestepped the issue, stating, among other things, the need to identify "the number of contracts is not the important factor; the need is to make sure we are able to carry out our mission."[54] This information, however, is vital. No component commander today can make rational decisions about combat or support requirements without knowing what contractor support can be relied upon.

The 1999 AFIA report reveals the Air Force is still facing similar problems. The report summarized that overall contractor support was highly effective and that its implementation was more than adequate for noncombat operations.[55] The summary's balanced tone, however, belies critical findings in potential wartime support. The report revealed there are no essential contractor service planning procedures or standardized approach for establishing contractor personnel oversight at deployed locations and current processes are reducing deployed contractor effectiveness.[56] The report included determinations that inspectors could find no consensus on who *owned* the support contractors and:

> *. . . most locations did not have any idea how many contractors were on an installation or who the contractors were. In some instances, command and control of contractors was maintained thousands of miles away* [Emphasis added].[57]

The criticality of the contractor visibility issue arises out of the need to ensure essential support gets to the deployed forces when needed. It does not seem, however, that Air Force policies and doctrine truly address how contracted support will be deployed in a rational and planned manner. Some senior military personnel interviewed as part of the AFIA report believed civilians not included on UTCs must be excluded from deployments because of concerns over force protection and logistics support. Other Air Force units, on the other hand, are already pursuing placing contractor employees on their UTCs because of the mission-essential nature of their tasks.[58] The report also found:

> Once the issue of placing contractors into an [sic] UTC is resolved, the focus changes to moving them to the battlefield. Here, the TPFDD [time-phased force and deployment data] is the process used to accomplish this in the most time and resource effective manner possible. In fact, one interview mentioned that if contractors are not in the UTC/TPFDD, but are required on the battlefield, there could be massive confusion and delays caused by the military and the contractors competing for limited transportation resources. *If doctrine establishes that contractors will be present on the battlefield, then policy needs to be developed to detail how that will effectively happen* [Emphasis added].[59]

While the Services are beginning to consider integrating and coordinating deployed contractor support, solutions seem to be a long way off. For example, senior military service logistics and supply personnel participating in an integrated joint logistics wargame, Focused Logistics Wargame 2010, in the summer of 1999 found use of in-theater logistics and support contractors was a major issue. The October 1999 wargame results were not encouraging, as a key finding in the assessment of contractor logistics support execution was the "lack of coordination between the acquisition and logistics communities is creating an unmanageable logistics support environment on the battlefield."[60] Concerns regarding this issue included:

- Contracts were being written without adequate consideration for theater integration.
- In-theater personnel faced a complicated mix of support arrangements.
- The flow of contractor support and materials was not integrated under the theater Commander-in-Chief's (CINC) control.
- The uncoordinated flow of contractor personnel into the theater complicated the CINC's responsibilities for force protection, clothing, housing, medical, transportation, and legal arrangements.[61]

The participants focused on the DoD's greater reliance on contractor support for these services, the segregation of the acquisition and logistics communities, and the lack of standards or requirements in the planning process as key causes of this problem.[62] The impact of this problem, which surfaced in every wargame event where extended sustainment support was required, included the:

- Free flow of personnel, materiel, and equipment without theater CINC visibility or control.
- Subsequent creation of multiple support mechanisms that complicate theater logistics coordination.
- Lack of force protection, base operations support, and status-of-forces agreement/legal coordination with theater CINC requirements.
- Lack of integration of contractor and DoD information systems.[63]

A draft joint publication, including guidance on contractors in the theater, addresses some of the concerns and calls for integration of theater support contractors directly into logistics plans and orders.[64] However, the draft document is silent in terms of how a supported theater commander would ensure movement and visibility of deployed contractors, coordinate their actions and incorporate them into TPFDD documents, move contractor assets and personnel into the theater, and ensure contractor compliance with local laws and regulations and theater-specific policies. In addition, the spring 1999 revision of Air Force Doctrine Document 2, *Organization and Employment of Aerospace Power*, makes no specific mention of contractor support despite detailed discussions of the logistics requirements in deploying air expeditionary wings.[65]

A key issue to consider when measuring a contractor's effectiveness in such situations is whether the Air Force can integrate it into the entire deployed force. The risk of not including these services as actual factors in planning or exercises is obvious. Without practicing use of these functions or taking advantage of their availability in peacetime, the risk of delays and nonperformance in operational or wartime deployments increased sharply. Despite the concerns cited, the perceived success of using contracted support services will almost certainly lead to their increased use in future deployments, with both positive and negative consequences.

The LOGCAP/AFCAP Alternative

In Bosnia I have three MACOMs: DISCOM, Signal, and Brown & Root.

Brigadier General Pat Oneal (ADC[S], 1AD), Winter of 1996[66]

One potential solution to the contractor coordination problem in deployed operations is to turn over large parts of the support services process to one large firm. This concept has gained acceptance within the US Army under its LOGCAP, which has procured base operating support during every major Army deployment since 1992.[67] Originally intended to provide basic life support, engineering, and maintenance work for the Army, the initial contractor, Brown & Root, worked closely with the Army to expand contract coverage in Somalia, Haiti, and Bosnia to include other services such as air traffic control, all fuel storage and refueling operations, additional civil engineering tasks, and other activities.[68] The Army is pleased with the results of the LOGCAP and follow-on efforts putting such services in the private sector. This concept, however, does not come without a price and problems. Concerns over cost overruns (the contractor in Bosnia exceeded the first year precampaign planning estimate by $111.3M) and the increasing size of the program led Congress to request a General Accounting Office (GAO) review of the program. The 1997 GAO report found the Department of Defense needed to improve its contingency contracting efforts in many areas, including guidance, cost reporting, and monitoring.[69]

The Air Force is using a similar concept through a $450M contract awarded in 1997 to Readiness Management Support for installation support capabilities typically performed by CE and services personnel under the Air Force contract augmentation program (AFCAP). The AFCAP contract specifically tasks the awardee with sustainment responsibilities after at least some beddown tasks are completed, as well as all traditional CE capabilities except for crash/fire/rescue and explosive ordnance disposal, and all traditional services capabilities, except mortuary and field exchange services.[70] In addition, under an Army contract, the Air Force used Brown & Root for installation and supply support services, including base operations and airfield management, supply and maintenance, crash and rescue services, and aircraft refueling at Taszar Air Base, Hungary, during Operation Allied Force.[71] The appeal of using these types of contracts (lower troop requirements and easier contractor coordination) makes them an attractive alternative to extensive military service support infrastructure in deployed operations.

Other Potential Management Solutions

Another potential way to ensure a component commander maintains visibility, capacity, and control over deployed contractor support services is to restrict use of contractors to the locations where the deployed military supply distribution system begins (a theater management center or TMC) and ensure the component commander has control over the logistics system through creation of a distribution management center (DMC).[72] The DMC commander would be the single focal point for distribution of supplies on the battlefield or operational area and would have the authority to cut through command and agency layers to ensure essential materiel flows to critical locations. The DMC would be tasked to create a workable theater supply distribution plan linked to the CINC's logistics guidance and sustainment flow from the CONUS.[73] Integration of private sector firms into the logistics system would be done cautiously and in a limited way with the TMC's primary focus in sending supplies being the supported commander. Private firms supporting units on the battlefield or operational area would be coordinated through the DMC, increasing control over distribution management.

A key difficulty in implementing this approach would be providing powerful independence to the DMC to control logistics and support activities across organizational boundaries. Another issue would be the criteria identifying the point where DMC control over supply distribution from private firms would begin.[74] The use of omnibus deployment support contracts such as LOGCAP and AFCAP may be able to mitigate many of the concerns cited regarding the need to coordinate, harmonize, and integrate contractor activities, as the theater commander has one point of contact. The TMC/DMC concepts could also mitigate these problems in a different way through centralizing contractor control in a deployed environment.

One partial solution to concerns over contractor performance would be to ensure that all contractors and their employees would be subject to the *Uniform Code of Military Justice* in a combat zone. The feasibility and complexity of imposing such a requirement is beyond the scope of this article. If implemented, this could raise confidence in contractor performance in deployed environments, even if it limited the number of contractors willing to operate in these theaters. A related initiative would be to mandate, via contract, employment of a certain percentage of Air National Guard or Air Force Reserve personnel in key positions. This concept could prove highly effective in meeting the need for responsive deployment of both military and contractor personnel. Depending on the contingency, key personnel with necessary skills would already be in theater, either called to active duty or employed by the appropriate private sector contractors.

An alternative to contractor performance would be to allocate a significant percentage of initial deployment support service activities to the National Guard or the Reserve. If properly managed and resourced, this could eliminate many of the concerns regarding active duty force overdeployment and whether such active duty forces would have positions at CONUS bases should these be subjected to competitive sourcing. The functions placed under National Guard and Reserve

responsibility would only be called upon as needed for deployments. Use of this concept could, in large measure, offset many of the concerns cited regarding use of contractors, including force protection, cost overruns, and failure to perform once the battle line moved close to support elements.

One concern with this concept involves the ability of such National Guard or Reserve support service activities to deploy in a timely manner in short-notice contingencies. Such concerns might call for the retention of certain levels of specialties in a rapid reaction, active duty support force. National Guard and Reserve forces could follow soon to continue this activity once deployed and either continue performance in a sustainment mode or turn the activity over to the private sector. Another concern regarding this concept would be the ability of and need for such National Guard or Reserve activities to maintain proper levels of training and expertise to act quickly and effectively in a deployed environment and still meet Air Force cost and budget reduction targets without putting undue additional strain on the Guard and Reserve. This could be accomplished as long as the Air Force, using the Total Force concept, made the appropriate commitment to training, equipping, and employing these forces.

A second alternative that could be pursued would involve the transfer of responsibility and overall control to the service with the predominant need for the required support services involved in a joint deployed environment. If, for example, a deployment depended primarily on fixed-wing aircraft deployment, the Air Force would take the lead on providing support services. An Army detachment would take primary responsibility in a deployment if rotary-wing aircraft were the primary focus. This concept could lead to further cost and personnel-saving opportunities through reengineering of support service activities. However, the initial cost of coordinating these activities would likely be high and the interservice obstacles formidable.

In determining whether contracted support services are effective, the ability of the force commander to have visibility and control over and the ability to integrate these private sector providers in an area of operations is absolutely vital. This capability must become second nature, rather than using contractors on a *trust-me* basis. To make this concept work for the Air Force, these ideas will have to become robust, thoughtfully considered concepts taking into account both the problems and the advantages of using the private sector in certain key areas. Methods to encourage the maturation of this concept should include:

- Enhancing partnering arrangements through special contracting rules and developing and implementing standard acquisition policies and requirements for such support services.
- Clearly determining which functions must be performed by military personnel and which can be contracted out.
- Developing integrated information systems between deployed contractors and participating Air Force units.
- Integrating LOGCAP or similar constructs in logistics planning.
- Involving outsourced support services in theater-level exercises, with senior representatives from current deployment-ready firms already under contract attending.
- Expanding Air Force, joint, and interagency workshops and wargames/exercises to feature use of LOGCAP or similar constructs for essential support services.[75]

Only after such steps are taken will use of an omnibus support contractor or a number of support contractors be truly integrated into the Air Force's deployable logistics infrastructure, inefficiencies reduced, and synergies exploited.

Core Functions Reassessed

While these potential solutions are essential for easing the pressure from ongoing competitive sourcing in Air Force support services, the most important changes to be made are at a more basic level. Changes must be made when determining whether support service activities are core or otherwise not subject to competitive sourcing competitions. The Air Force and its appropriate activities must continue to reassess the decision criteria regarding which support service activities will remain core are made, such as the current Air Force policy to exclude deployable positions from competition. The Air Force and the other Services have ostensibly used contractors to *supplement* their personnel in deployment actions, in essence, determining these tasks are not *core* in terms of having to be performed by military personnel. In fact, reviews of programs such as LOGCAP demonstrate the Services are, in fact, using contractor support to replace military personnel.

CS proponents often look to the private sector for justification to contract out parts of the DoD mission considered noncore, basing the analysis on the business concept of keeping in house only those functions or processes that provide the customer value and the corporation a competitive advantage. A key issue, however, is, while private companies develop specific core competencies (McDonald's in fast food delivery, Microsoft in consumer and business software, and so forth), *these competencies are integrated, complex systems*, not discrete functions. Core competencies can, in fact, be defined as those processes giving the firm a competitive advantage, built and sustained through a few highly focused mixtures of skills, technologies, process design, and concentrated corporate culture.[76] *Core competencies are surely not just discrete functions that can be performed separately by other companies*.

The private sector has acknowledged this and keeps those functions in house that directly impact their ability to provide the consumer their preeminent product. The federal government and the Department of Defense, however, generally use the *OMB Circular A-76* analytical model of reviewing discrete functions and whether the private sector can perform them, with only limited exceptions. In many cases, for simple tasks and those not directly affecting national security, this approach is valid. However, in cases where commercial tasks directly impact the deployed warfighter, whether on the battle line or behind, and where private sector performance of such tasks raises serious cost, security, or performance concerns, the Air Force must reassess whether such functions should be considered core—*not just focus on location or deployability but on the secondary/downstream effects on deployment effectiveness of using the private sector to perform these functions.*

The following criteria should be central to any such reassessment:

- A consideration of the type of services required when deployed overseas, anticipated length of deployments for this support service specialty, and likelihood this specialty will be in combat conditions during deployment.
- An assessment on what level of risk a private sector employee would subject other civilian and military personnel to if used in a combat support situation.
- An analysis of the effect of using various mixes of public and private sector assets and personnel to flexibly and effectively deploy Air Force assets. This should consider the effect of using contractors both in deployed forces and at CONUS bases.
- A review of the perceived need for each support specialty in likely deployments (two major regional conflicts versus humanitarian operations and so forth).

Adopting these recommendations and analytical criteria should ensure the Air Force receives maximum performance from its deployable forces (active duty, National Guard/ Reserve, and federal civilians), as well as contractor personnel, at a reduced cost, without adding unnecessarily to force protection, contractor management/integration, or active duty deployment stress problems.

Recommendations and Conclusions

The benefits of contractor support are well known and numerous. Cost reduction, fewer military resources devoted to nonmilitary tasks, and synergies with private industry are just a few. While the Air Force will, for the foreseeable future, continue to pursue competitive sourcing as a key tool in meeting budget and personnel constraints and finding new moneys to modernize weapon systems, careful consideration needs to be taken in establishing criteria for such actions and analyzing where these activities may go too far. This concern becomes critical when discussing the actual or potential competitive sourcing of support services involved in expeditionary or other deployments. The ability of a component commander to track private sector contractors, utilize their capabilities in theater and integrate them effectively with the deployed force, and ensure essential support in combat and near-combat situations is absolutely vital to successful employment of Air Force units and contractors overseas.

In balancing these fundamental considerations, it is no longer enough to review commercial activities in a functional manner, focusing on whether there is a private sector market available to provide the service. The Air Force must also examine the downstream/secondary costs of moving these services into the private sector, including additional Air Force assets in contractor oversight and force protection, retention of active duty forces as potential deployments increase, and risks to the active duty force should key contractors or their personnel fail to perform as required.

Support service personnel today are closer to potential battle lines than ever before and are often the first or among the first to deploy. In low-intensity conflicts with a sympathetic security environment, such as humanitarian relief operations or peacekeeping after a political settlement is reached, extensive deployed contractor support services may entail few risks. In higher intensity conflicts, where security becomes a greater concern and the need for timely and effective performance becomes even greater, the risk of using contractor services also rises.

This discussion leads to a number of options for the Air Force as it faces pressure for increased competitive sourcing. The Air Force may determine the risk of continuing competitive sourcing these support services is too great and eliminate these positions from further consideration. In light of the continuing pressure to reduce costs and personnel and with the existence of commercial sources for these functions (LOGCAP, AFCAP, and so forth), acceptance of this alternative seems unlikely. Another alternative is to employ one or a number of the alternatives in this analysis to try to balance risk and cost savings. Finally, the Air Force can decide to continue to march forward with existing competitive sourcing practices and assume remaining military personnel can handle the increased burden of fewer resources and greater responsibilities involved with increased deployed contracted support.

Based on current trends, the Air Force will likely continue in its present course, hoping that informal arrangements and evolutionary change in the employment of deployable contractor supply support will cover its needs and eventually reduce stress on the active duty force. This approach may well prove unsuccessful. Even if the potential solutions provided herein—including use of omnibus private sector contractors for virtually all deployed support services, coordination of deployed support contractors through a distribution management center, greater utilization of Air National Guard and Air Force Reserve personnel for such deployable functions (separate from or in conjunction with the private sector or the other Services), and use of more joint supply services—are fully utilized, they will satisfy only part of the equation. The Air Force must also reassess its criteria for determining which processes and functions will be subject to competitive sourcing and make this decision based on the overall effect on the Air Force in deployment actions. This reassessment could eventually lead to a determination that the problems associated with this type of competitive sourcing outweigh its benefits, ultimately leading to a halt in this process. Performing this assessment sooner, rather than later, is imperative, as the future budget implications of reduced cost savings must be acknowledged and the loss of trained Air Force personnel for these functions, once private firms take over performance, is almost always permanent.

In the end, all this comes down to a risk analysis. The Air Force is balancing the need to reduce costs with the need to ensure timely, effective, and dependable support services in deployment actions. A detailed assessment of fundamental support service needs during deployments—balancing the benefits (potentially reduced costs and fewer Air Force personnel involved overseas) of private sector support with its risks (increased force protection and contractor oversight costs, potential lack of control, and integration over vital support services)—is essential if the Air Force is to protect its personnel, continue to perform at a high level of excellence, and meet budget and manpower targets.

The stakes are high. The failure of these deployed contractors to perform adequately, in combination with the increased strain upon a smaller number of military members, can increase the chances of mission failure and that US military and civilian personnel will become casualties. These concerns must be addressed. Only once this is resolved can the Air Force truly find the right mix between the public and private sector in its most important role, supporting the national security strategy around the world.

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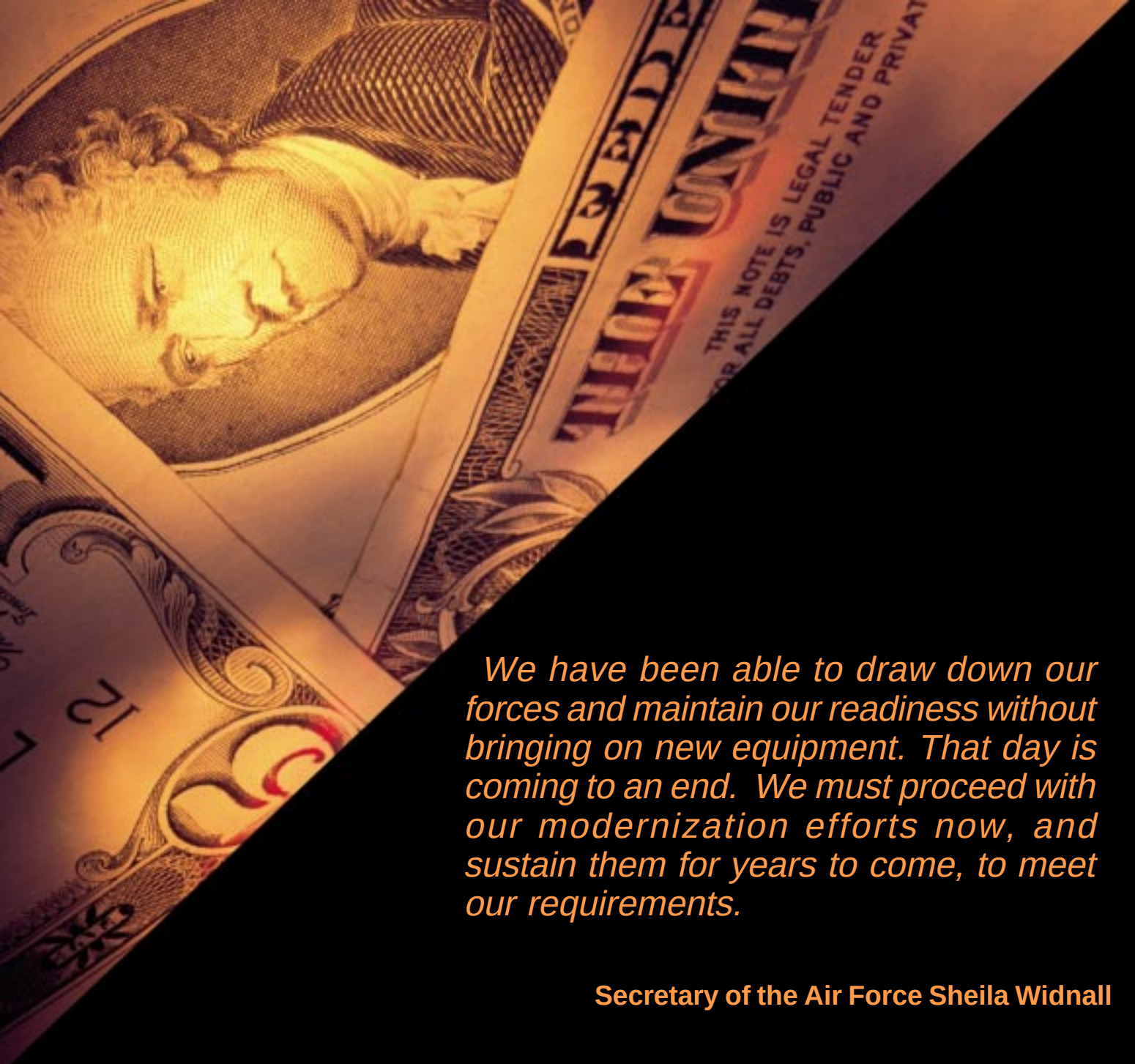

We have been able to draw down our forces and maintain our readiness without bringing on new equipment. That day is coming to an end. We must proceed with our modernization efforts now, and sustain them for years to come, to meet our requirements.

Secretary of the Air Force Sheila Widnall

are we on ta

competitive sourcing & savings

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Pick up any newspaper or magazine, and you will see headlines such as "IBM Consolidates Plants; Lays Off 7,000 Workers" or "Motorola Outsources Data Processing Facility." In its bid to become more competitive in the marketplace, corporate America slashed costs and increased efficiencies by downsizing work forces, consolidating facilities, and outsourcing noncore functions. While most citizens are familiar with private industry's outsourcing initiatives, few are aware of the mammoth Department of Defense (DoD) competitive sourcing program and its role in US national military strategy.

The end of the Cold War marked a significant shift in the international strategic environment and led to changes in the US military's responsibilities and force structure. Over the last 10 years, the DoD reduced its active military personnel by more than 700,000 members and eliminated 8 Army divisions, 11 Air Force fighter wings, 4 Navy aircraft carriers, and 232 battle force ships. Despite these combat force reductions, support costs

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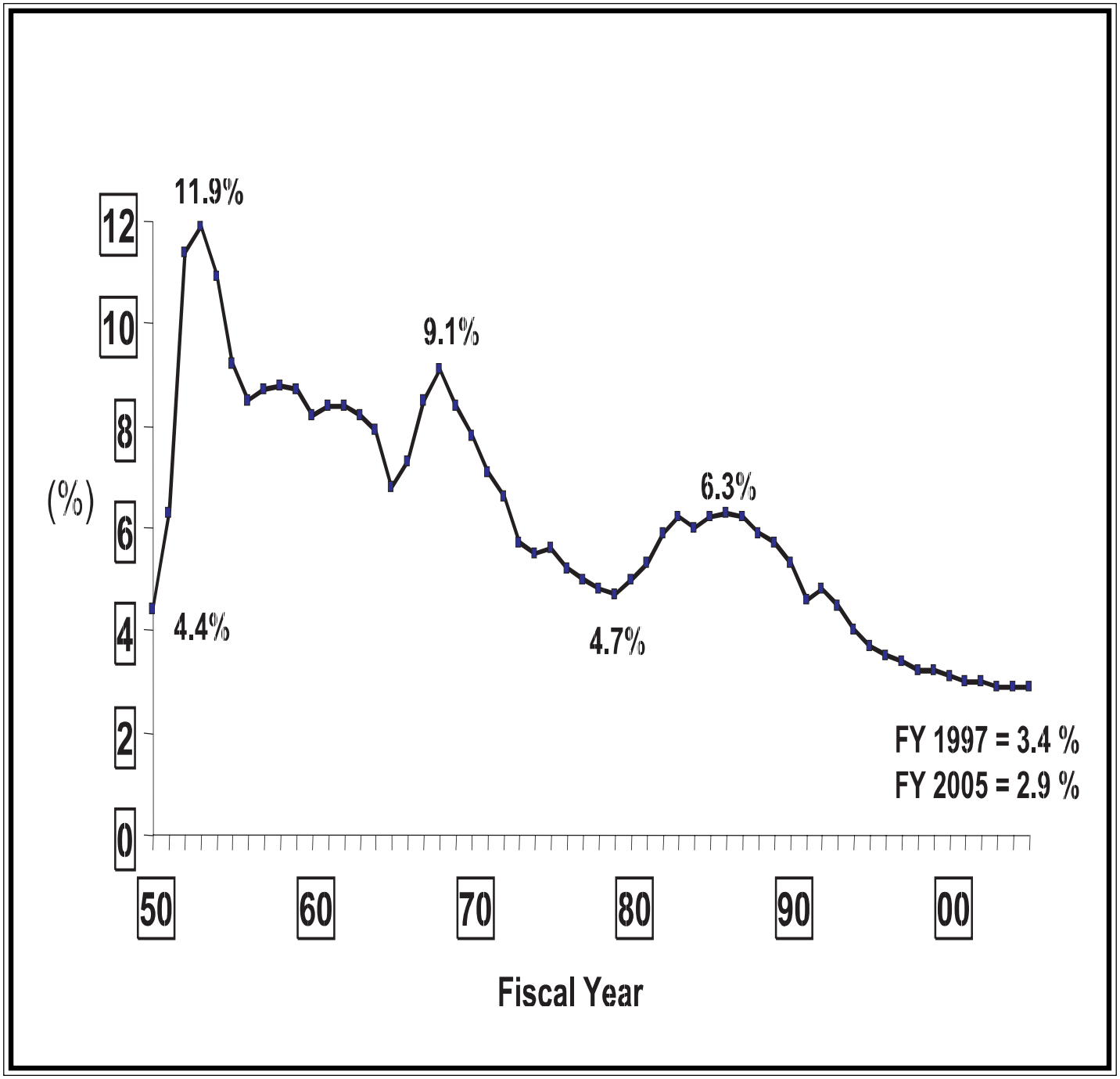

Figure 1. Defense Budgets as a Share of Gross Domestic Product, 1950-2002[6]

have climbed to $170B a year and now consume nearly 70 cents of each defense dollar compared to 50 cents prior to the drawdown.[3] More important, the DoD has been forced to use funds earmarked for modernization programs to cover unplanned operating expenses, resulting in delayed and more costly acquisition programs. These actions divert resources from the military's core warfighting mission and impact its short- and long-term readiness.

To counter this trend, the DoD is pursuing competitive sourcing (CS) to reduce operating costs and free up resources for its modernization programs. Past history indicates CS can yield significant savings. According to a recent study by the Center for Naval Analysis, cost savings from prior CS studies amount to $1.5B annually—or approximately 30 percent—compared to baseline costs.[4] The military has high expectations for its reenergized CS program and has programmed more than $6.2B additional savings into its fiscal year 1999-2004 budgets to procure new aircraft, helicopters, warships, and upgrades to Army ground combat vehicles.[5] However, Congress and the General Accounting Office have criticized this approach and claim the projected savings may not be achieved due to contract cost growth and related factors.

A firm grasp of the causes of contract cost growth is the key to formulating successful outsourcing strategies, developing effective contracts, and achieving maximum efficiencies and savings. If projected savings from these initiatives do not materialize, the DoD will be unable to maintain its day-to-day readiness or continue critical modernization programs without

seeking additional funding from Congress. This will prove to be a challenging and painful process for future military leaders as the battle for the taxpayer's dollar escalates.

Background

In order to be able to afford capabilities sufficient to support our existing military strategy and provide adequate investments to prepare for the future, the Air Force must find ways to become more efficient. . .it is time to focus on freeing up excess resources committed to our support functions.

General Michael Ryan, Chief of Staff, USAF

Goals of the Military's CS Program

As defense budgets dwindle, the military departments are struggling to maintain current mission readiness, fund quality-of-life and pay reform initiatives, and modernize their aging weapon systems. The Services have also been challenged by Vice President Gore's National Performance Review to streamline their operations and improve the quality of services provided to their customers. As Figure 1 illustrates, defense budgets as a percent of national gross domestic product have been on a downward trend since the mid-1950s and are unlikely to increase significantly in the near future. To ensure current and future readiness in this fiscally constrained environment, the DoD turned to competitive sourcing as a way to free up resources for its highest priorities.

The Air Force's primary competitive sourcing goals are to improve performance, quality, and efficiency; focus on core activities; and generate savings for modernization.[7] These goals are quite similar to those of civilian counterparts. A survey of business leaders at more than 1,200 private sector companies indicated that outsourcing initiatives are undertaken because they result in lower operating costs, provide access to new resources and world-class capabilities, and improve overall management.[8] These cost reductions and improvements come through the competitive process but not solely from outsourcing the functions. When competing in-house commercial activities with private industry, the government examines existing manpower requirements, processes, and capital requirements and proposes a new way of doing business. The government's proposal is compared to the best private sector bid sector to determine the most cost-efficient provider. This competition generally leads to lower costs, improved performance, and streamlined operations, regardless of who wins the competition.

Outsourcing also allows the DoD to focus on its core competencies. The US military is responsible for the nation's defense, and it accomplishes this mission with a mix of core warfighting skills such as flying strike sorties, deploying armor assets, and intelligence operations. However, DoD personnel also perform what some consider noncore tasks such as food services, engineering, maintenance, overhaul, repair, and training functions. The military can refocus its limited resources, both human and investment capital, on its core warfighting mission by outsourcing these functions. Considering the recruiting difficulties that the Services are currently facing, competitive sourcing offers a potential force management tool that can release military members from noncore functions and reassign them to unfilled warfighting billets.

While these other goals are important, the primary objective of the military's competitive sourcing program is to free up scarce budget dollars and realign them to modernization accounts. Everyone is familiar with the stories about aircraft that are older than the pilots flying them; however, few realize these weapon systems become increasingly expensive to maintain as they age, which further saps limited defense budgets. Moreover, acquisition programs for advanced aircraft, warships, and vehicles will most likely be more expensive in the future. By one account, the Joint Chiefs of Staff are facing a $20B annual shortfall between the current procurement budget and the funding needed to modernize aging weapon systems. However, the estimated shortfalls may be even higher, reaching nearly $55B per year by 2004.[9] The military's ability to maintain battlespace dominance may be in jeopardy in the near future if this trend of under funding and delaying modernization programs continues.

Opportunities to reduce costs within the DoD exist, and these funds can be used to recapitalize the aging force structure. For example, the Navy reduced the average cost of overhauling an F-14 airframe from $1.69M to $1.29M—a 24 percent reduction—by conducting a public-private competition.[10] The Defense Printing Office realized $70M in annual savings by implementing an aggressive competitive sourcing and reengineering program that reduced its staff by 43 percent, reduced the number of facilities by 30 percent and square footage by 700,000 square feet, and disposed of more than 4,000 items of obsolete or traditional printing equipment.[11]

Statutory Basis and Guidelines for Competitive Sourcing

If cost studies are time-consuming and potentially disruptive to an in-house work force, why even consider outsourcing a function? The simple answer is because the law requires it. According to long-standing national policy, the government will not compete with its citizens and should rely on commercial sources for goods and services, provided these goods can be procured more economically from commercial sources. This policy was first publicized through Bureau of the Budget Bulletins issued in 1955 and subsequently revised and codified in various public laws.[12] Public Law 105-270, the Federal Activities Inventory Reform Act of 1998 (*FAIR Act*), outlines the most recent statutory requirements for identifying, tracking, and reporting commercial activities. *Office of Management and Budget (OMB) Circular A-76* provides instructions for conducting competitions and preparing cost estimates.

The FAIR Act requires all executive and military departments to review commercial activities and determine if they should be performed under contract with commercial sources or in house with government personnel and facilities. The process is competitive, and cost comparisons must reflect all costs.[13] To aid in this process, *Circular A-76* and its supplemental handbook provide instructions for preparing cost comparisons and conducting public/private competitions.

Not all functions within the Department of Defense are subject to outsourcing. Certain activities are considered so integral to the command and control of military operations or governance that they cannot be contracted out, whereas other functions are easily transferable to the private sector. *Circular A-76* and Office

of Federal Procurement Policy (OFPP) Policy Letter 92-1 classify functions as either commercial activities or inherently governmental functions. Commercial activities are those functions performed by in-house personnel that could be obtained from commercial sources such as health services, data processing, or real property maintenance. As such, commercial activities may be suitable for performance by contract and are subject to cost comparisons under the *Circular A-76* program. Conversely, *Circular A-76* defines an inherently governmental function as one "which is so intimately related to the public interest as to mandate performance by government employees" and, therefore, cannot be outsourced. [14]

This distinction is significant since only 29 percent of all DoD civilians and 9 percent of DoD military billets listed in the 1995 Commercial Activities Inventory were classified as commercial activities and subject to competitive sourcing.[15] Potential CS savings could increase significantly if DoD reclassified more billets as commercial activities and competed them (or decrease if more billets are reclassified as inherently governmental functions). One study estimates savings will increase by 2 percent for every additional 1 percent of civilian billets competed and nearly 5 percent for every additional 1 percent of military billets competed.[16]

Overview of the A-76 Cost Comparison Methodology

OMB Circular A-76, Performance of Commercial Activities, was not designed to simply outsource functions. As highlighted in its supplemental handbook, this program was designed to:

- Balance the interests of the parties to a make or buy cost comparison.
- Provide a level playing field between public and private offerors to a competition.
- Encourage competition and choice in the management and performance of commercial activities.

It is designed to empower federal managers to make sound and justifiable business decisions.[17] To this end, *Circular A-76* provides specific guidelines for conducting competitions and preparing cost comparisons. Once an activity is identified as a candidate for a CS study, there are two ways to compete it within the A-76 program: direct conversion or cost comparison. If the activity has ten or fewer appropriated fund (APF) civilians, the local commander may directly contract out the function without developing an in-house bid. This is a streamlined approach with few reporting requirements. If there are more than ten APF civilians, a formal cost comparison is required. If more than 50 APF civilians will be affected, then Congress must be notified prior to announcing the initiative.[18] Commercial activities performed by an all-military work force can also be directly converted to contract without a cost comparison. The local commander may opt to compete small activities (less than ten APF civilians) using the more comprehensive cost comparison option.

The A-76 cost comparison is perhaps one of the most talked about and yet least understood of all the programs within the government. In its simplest form, an A-76 study develops a statement that describes what work needs to be done, compares the in-house cost estimate for performing this work with a contractor proposal, and selects the lowest cost provider. Figure 2 provides an overview of the cost comparison process and is followed by a discussion of the key activities as described in the *Commander's Handbook On Competitive Sourcing.*[19]

Write the performance work statement (PWS) and quality assurance surveillance plan (QASP). The PWS is the most important document in the entire process since it serves as the basis for both the in-house and contractor cost estimates. It clearly

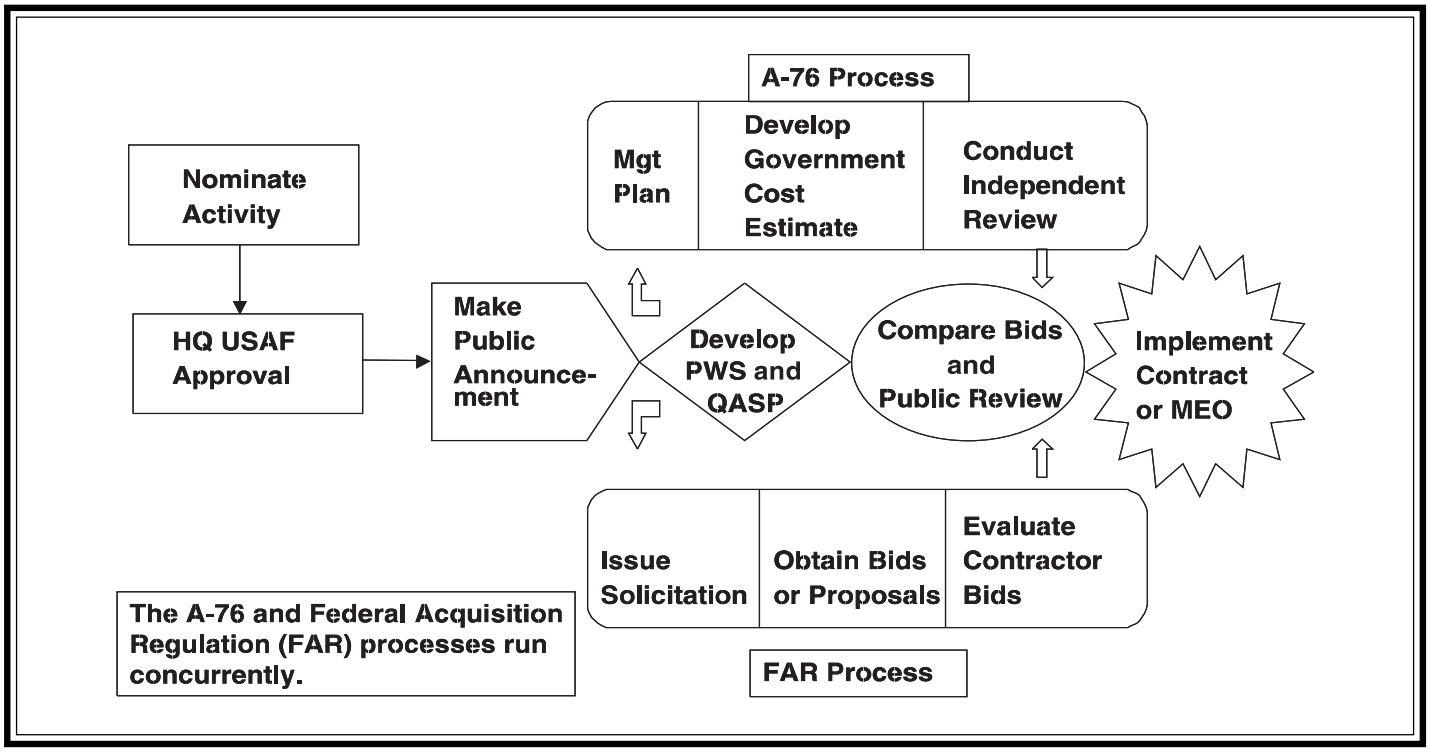

Figure 2. Overview of A-76 Cost Comparison Process[20]

Organization	Completed Competitions	Baseline Civilians	Baseline Military	Total Annual Savings ($M)	Percentage Savings
Army	466	21,530	3,728	443	28
Air Force	760	18,147	8,633	571	36
Marine Corps	44	1,291	157	25	31
Navy	807	20,793	4,821	413	30
Service Total	2,077	61,761	17,369	1,452	31
DeCA	39	418	5	6	39
DMA	1	68	0	.02	1
DLA	14	1,080	0	11	18
Agency Total	54	1,566	5	17	22
Grand Total	2,131	63,327	17,344	1,469	31

Table 1. Savings by Military Service/Agency for Completed A-76 Competitions[22]

identifies the workload in terms of performance standards and answers the questions of *what, when, where, how many, and how well*. It is important to note that the PWS describes *what* work needs to be accomplished, but not *how* to do it. The *how* will be described in the offeror's proposal. The QASP is derived from the performance standards and is used to determine if the Services rendered meet the PWS standards. The organization performing the function is responsible for developing the PWS and QASP with assistance from base contracting and manpower units.

Conduct a management study and create the in-house bid. The management plan is a comprehensive package consisting of the most efficient organization (MEO), QASP, in-house cost estimate (IHCE), and transition plan. The objective of the MEO is to find new ways to perform the work in the most cost efficient manner. The MEO describes *how* the in-house team will perform the work as well as manpower, budget, and facility requirements. The MEO should take advantage of this opportunity and propose innovative work processes and streamlined manpower requirements for performing the tasks specified in the PWS. A QASP, similar to the one described above, is developed to monitor in-house performance, and the IHCE identifies how much it will cost to establish and operate the MEO. Finally, the transition plan explains how the organization will transition to the MEO or contract.

Solicit contractor bids. Once the PWS is developed, the contracting office prepares and issues a solicitation to the private sector. Contractors will review the work requirements outlined in the PWS and develop proposals based on the work described in the performance work statement. This step generally runs concurrently with the preceding step.

Compare bids and decide on a winner. The contracting office will evaluate all contractor proposals, select the best bid (based on the acquisition strategy), and compare it to the IHCE. To ensure the government does not convert activities with marginal returns, the in-house proposal automatically wins unless the private sector's direct personnel costs are at least 10 percent lower than the in-house bid or saves more than $10 M over the performance period.

Transition to the MEO or contractor and monitor post-award performance. After the final decision is made, the workload transitions to the MEO or contract according to the transition plan. Regardless of who wins the competition, the government is still responsible for monitoring contract performance. If the contractor wins, the contracting office implements the post-award contract administration plan and uses the QASP to measure compliance with the performance standards. If the workload remains in house, a government team conducts a post-MEO performance review to verify that the MEO was properly implemented, completed all work requirements specified in the PWS, and did not exceed the in-house cost estimates submitted during the competition. Should the MEO's performance or costs fail to meet the PWS standards, the contracting officer may award the contract to the best contractor proposal.

Historical Results from Previously Completed CS Studies

Circular A-76 and the competitive sourcing program are nothing new to the Department of Defense. The military has conducted thousands of A-76 competitions, simplified cost comparisons and direct conversions over the last 30 years, and plans to pick up the pace in the future. Between 1978 and 1994, the DoD conducted 2,131 A-76 competitions involving more than 30,000 military and civilian billets and generated more than $1.5B in recurring annual savings.[21] The in-house team won roughly 50 percent of the competitions, and savings averaged 31 percent. Table 1 is a breakout of A-76 competitions by Service and agency.

Based on the military downsizing that occurred during the 1980s and early 1990s, it seems logical to assume all of the *easy* targets have been outsourced and future savings will be more difficult to find. However, studies by the Center for Naval Analysis and the General Accounting Office (GAO) indicate otherwise. The Center for Naval Analysis studied the average savings per billet from 1977 to 1995; the savings consistently averaged between $10K and $20K. To the extent there was a trend, it was an increase in the savings per billet.[23] This upward trend in projected savings was also evident in a more recent review of the DoD's competitive sourcing program. The GAO audited 53 A-76 competitions completed between October 1995 and March 1998 and reported the average projected savings had increased from 30 to 42 percent and the contractor had won 60 percent of the bids. All of this evidence suggests the military has not *cherry-picked* all of the easy candidates.

Most A-76 competitions to date involved relatively small functions, while the DoD's largest commercial activity—depot maintenance—has been largely exempted from the A-76 process. This workload represents the crown jewel of potential outsourcing candidates since the DoD spends roughly $15B for depot maintenance work such as repair, overhaul, modification, and upgrade to aircraft, ships, tracked vehicles, and other systems and equipment.[24] The DoD Appropriations Act for fiscal year 1985 allowed a test program to compete ship overhauls. This program was later expanded to include public-private competitions for Army, Air Force, and Navy depot maintenance workloads.[25] The 1995 Commission on Roles and Missions

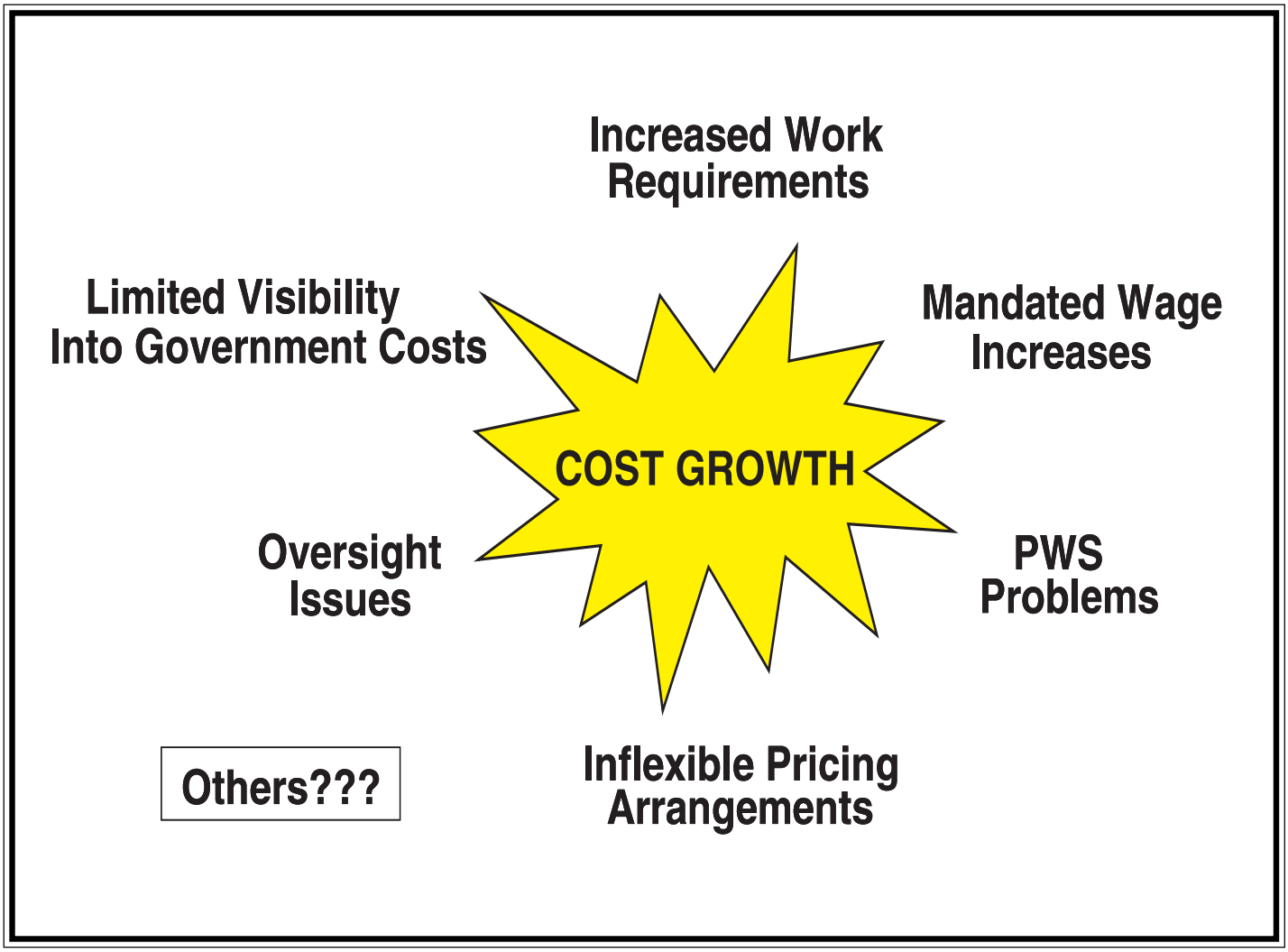

Figure 3. Factors Impacting Costs and Savings

claimed the DoD could save 20 percent by privatizing depot maintenance activities and not adversely impact military readiness and sustainability. Subsequent base realignment and closure decisions have led to the closure of two Air Force depots.

These savings do not come without a price. A-76 competitions are manpower-intensive undertakings. The government team must develop the performance work statement, quality assurance surveillance plan, and most efficient organization; conduct source selection boards; compare bids; and award contracts. Each of these activities requires time, material, and in some cases, assistance from support contractors. For example, a recent A-76 competition for the operation of fuel facilities spent more than $5K per billet for contractor support, and this figure does not include the cost of government personnel or travel.[26] Another source estimates that it costs between $2K and $6K per billet competed.[27] Organizations must plan for and receive adequate funding to support A-76 cost studies.

Although Congress and the GAO contest the magnitude of the DoD's projected savings, they do agree the competitive sourcing program offers significant opportunities to reduce costs and improve efficiencies.[28] Unfortunately, it is not clear exactly what level of savings will actually be achieved. They criticize the military's ability to substantiate the savings and claim:

- The DoD did not know the extent to which expected savings were realized since cost information was not routinely collected and analyzed after a cost study was done.
- Savings estimates represent projected, rather than realized savings.
- Actual savings were not tracked.
- Baseline cost estimates were lost over time and did not include the costs of competition.
- Most important, where audited, projected savings have not been achieved.[29]

Analysis of Selected Competitive Sourcing Programs

Outsourcing and privatization is a pass-fail item if we are to remain the force that this nation needs in the decades to come.

Sheila Widnall, Secretary of the Air Force

Although there are many well-managed, cost-effective CS contracts in place today we can glean many useful *lessons learned* by studying programs that encountered problems in the

past. The ultimate goal is to learn from these experiences and, hopefully, avoid similar pitfalls in the future.

Causes, Causes, and More Causes

"What causes cost growth in CS efforts?" The A-76 process is relatively complex, and the entire process is impacted by a number of internal and external factors. Figure 3 illustrates some of the key factors impacting costs and savings. For example, the government team may have difficulty assembling and retaining skilled personnel responsible for determining workload requirements, writing the performance work statement and quality assurance surveillance plan, developing the most efficient organization and in-house cost estimate, and conducting post-competition quality assurance reviews. Shortcomings in any of these areas will adversely impact the outcome of an A-76 cost study, not to mention complications associated with accounting system limitations, Federal Acquisition Regulation requirements, and other downward directed mandates. As a result, it is often difficult to determine if the government actually achieves the projected savings from its competitive sourcing program. The following case studies examine these internal and external factors and how they impact the overall CS process.

Increased Contract Requirements and Mandated Wage Increases

Contract cost growth is perhaps the most misunderstood phenomenon associated with competitive sourcing contracts. Many people assume contractors take unfair advantage of the government by low balling their initial bid (buying-in) and then passing on substantial price increases once they win the contract. While this may happen in isolated cases, a DoD Inspector General review of commercial activity contracts indicates most cost growth results from mandated wage increases and increased within-scope work requirements.[30]

The DoD Inspector General reviewed 20 Army, Navy, and Air Force CS contracts to determine the extent to which costs exceeded the original negotiated prices and reasons for the cost growth. These contracts, which had been in place for at least three performance periods, covered a wide range of functions, including food service, custodial service, base operations support, transportation, and aircraft maintenance. After reviewing the original cost comparison, PWS, contract files, and amendments, they determined cost growth occurred in all 20 contracts and observed:

- The contracts, which were originally negotiated for $522M, experienced net cost growth of $108M (21 percent).
- $31M of this cost growth was due to mandated Department of Labor wage increases under the Service Contract and Davis-Bacon Acts.
- The remaining $77M was attributed to changes in within-scope work requirements ($111M of increased work requirements offset by $34M of decreased within-scope work requirements).[31]

At first glance, it appears CS contracts should be avoided since they exhibit a tendency to increase in cost. However, contract cost growth does not necessarily equate to problems with the contract. For example, $31M of the cost growth was due to federally mandated wage increases. These are *known* annual increases that occur to all service contracts, and they should have been anticipated during the cost comparison process. Closer examination of the data also indicates a majority of increased work requirements was associated with nonrecurring costs from contingency operations or mission changes. For example, nonrecurring costs from Operations Desert Shield and Desert Storm accounted for nearly $45M of the $111M of increased work requirements, and the addition of a new T-1 aircraft mission at Reese AFB increased operating costs by $8.5M. As a senior Air Force leader commented, "In-house operations would have experienced similar cost increases . . . many GAO audits exist to support this statement." [32]

The overall impact of contract cost growth is that it may invalidate the original cost comparisons and make it difficult to determine actual savings since the current workload differs significantly from the baseline cost estimate. Additionally, unanticipated cost increases can also cause budgetary problems since the installation may have to divert funding from other programs to pay for these changes. Cost growth, in isolation, does not automatically equate to poor cost discipline or poorly written contracts. It may simply be the by-product of federal mandates or shifting military requirements.

Problems with Performance Work Statements

The entire cost comparison process hinges upon the performance work statement. A well written PWS contributes to a dispute-free competition and post-award success, where a poorly developed PWS often leads to customer dissatisfaction, contractor default, and reduced efficiency and effectiveness. In theory, it should be relatively easy to develop a good PWS. The government team simply describes what it wants (provide food services, conduct security investigations, or perform programmed depot maintenance). However, in practice, this step is often more manpower-intensive, time-consuming, and difficult than it first appears.

The government team walks a fine line when developing the PWS. It must ensure all essential tasks are included, yet avoid the temptation to incorporate every possible contingency into the PWS which ultimately drives costs up. There are numerous examples where the PWS failed to include all the required tasks to be performed and other cases where the PWS contained tasks that were not currently performed by the in-house work force and would not be performed even if the function remained in house. The following examples illustrate opportunities where the government can improve its CS process by developing accurate, comprehensive performance work statements.

In May 1998, the Air Force Audit Agency reviewed the mess attendant contract at McConnell AFB to determine if this outsourced function was effectively and efficiently managed.[33] Their review of the existing contract and the invitation for bid (IFB) for the follow-on contract found the contract requirements were overstated and included work that was no longer needed. For example, the PWS overstated the monthly meal count by nearly 7,000 meals (20,000 monthly meals vice 13,000 historical usage), and the IFB included provisions for short order cooks even though cooking duties were not part of the mess attendant contract. The PWS also indicated that the contractor was

responsible for watering live plants, dusting silk plants, and dry-cleaning the drapes within the dining facilities. However, a separate contractor receives $2.4K a year to maintain the live plants, there are no silk plants in the dining facilities, and the drapes were replaced with venetian blinds nearly 5 years ago. While this may seem comical, it is costly. By revising the PWS to better match anticipated workload requirements with its actual needs, the Air Force can reduce its operating costs by $381K annually.

The Marine Corps' efforts at outsourcing base operating support functions at Parris Island were also plagued by problems with a poorly developed PWS. According to a study by the Center for Naval Analyses (CNA), Parris Island was the first Marine Corps base to hire contractors to operate government-owned utilities (water, sewage, and power plant operations).[34] The MEO bid $27M for this workload; however, the winning contractor bid $19M and was awarded the initial contract in 1988. Although the A-76 process leading up to the contract award took nearly 5 years, the CNA characterized the performance work statement as *very rough* with incomplete or missing data. The PWS was unclear regarding responsibilities for maintenance and operation of the steam plants and sewage treatment facilities, and each side blamed the other for poor operating results. The contractor requested upgrades and improvements to keep the plant equipment in good condition, and the government claimed contractor failed to operate or maintain the facilities properly.[35] The initial contractor went bankrupt, and a new contractor was found. However, the PWS problems persisted, and the government declared the second contractor in default and brought the workload back in house. Fortunately, nearly 160 of the 200 contractor employees stayed on and transitioned to the in-house work force. However, this particular situation never generated the savings projected by the A-76 cost study and also resulted in lower quality service throughout this 7-year ordeal.

Each of these examples illustrates the importance of accurate, comprehensive performance work statements. Clearly defined work requirements and performance standards help avoid misunderstandings between the organization receiving the services and the organization performing the function. These oversights could have been avoided by involving the technical experts with the contract specialists earlier in the process and working with potential bidders throughout the solicitation phase. The government and contractor teams would have both benefited by this increased interaction since it offers more opportunities to communicate expectations and clarify misunderstandings *before* the effort is outsourced.

Inflexible Pricing Arrangements

The contracting process has a certain degree of *built-in* conflict due to the competing self-interests of each party. The government seeks the best service, highest quality, and minimal risk at the lowest cost, where the contractor generally seeks ways to fulfill its contract requirements while maximizing profit. Although this observation obviously does not fit all situations, it helps set the stage for examining how the contracting process impacts potential costs and savings associated with competitive sourcing contracts.

The government typically uses fixed-price or fixed-price incentive contracts to acquire services under the A-76 program. Depending on the specific pricing arrangements selected by the contracting officer, the pricing structure may be classified as flexible or inflexible. According to one study, a flexible contract pricing structure contains predetermined factors that allow the government to increase or decrease contract payments in proportion to changes in the workload requirements.[36] In contrast, an inflexible contract pricing structure includes standard variations in workload, changes, or termination for convenience clauses. In these instances, the government may be put at a disadvantage since it must negotiate workload changes with the contractor in a sole source environment. The following examples illustrate the potential advantages the government gains by maximizing the use of flexible contract pricing structures.

The Air Force Audit Agency evaluated 18 installation-level service contracts resulting from prior competitive sourcing initiatives and determined 11 contracts lacked the flexibility to respond to workload reductions.[37] For example, demand for Air Education and Training Command's (AETC) command-wide simulator contract dropped from 16 hours per day to 8 hours. Despite this 50 percent reduction in requirements, the contractor would only agree to a price reduction of $170K—or 3.3 percent. Similarly, the workload for the fuels management contract at Williams AFB dropped by 45 percent after its T-37 aircraft were transferred to other locations, but the contractor would only agree to a price reduction of $50K—or 1.7 percent. According to this audit report, the Air Force paid more than $3M a year for unneeded services.

Inflexible pricing arrangements were not limited to AETC. The Air Combat Command experienced a similar situation with its Gila Bend range management contract. In this case, the Air Force paid for 350 aircraft inspection services and more than 1,300 hours of environmental services as specified in the PWS, even though it used only 164 air inspection services (53 percent) and 239 hours of environmental services (18 percent).[38] This contract did not contain provisions to allow for periodic comparisons of contracted services to actual services, and an audit determined contract payments could be reduced by $806K over 6 years by adjusting the transient alert, environment, and billeting services to match actual requirements.

On the other hand, the Army successfully incorporated flexible pricing arrangements into its pilot training contract at Fort Rucker. The Army has contracted out the primary phase of its pilot training for more than 30 years and received high-quality results with few problems. Contract flexibility is one factor contributing to this success. According to the Center for Naval Analyses, the contract allows the Army to respond quickly to changes in its training workload since it may request additional instructors by giving the contractor a 60-day notice and reduce the number of instructors with a 30-day notice.[39]

As these examples demonstrate, flexible pricing arrangements offer the potential for improved cost effectiveness; however, they are not a *cure-all solution* and may not be appropriate in all cases. For example, certain workloads have a large fixed-cost component and are not conducive to proportional reductions since the contractor cannot easily shift idle resources to other revenue-generating activities. This is often the case when dealing with workloads that require significant investment in plant equipment and dedicated work forces, such as those performing depot maintenance and other capital-intensive functions. As a result, the contracting officer must work with private sector

counterparts when contemplating these types of arrangements and identify an approach that minimizes risk to both the government and the contractor.

Oversight Issues

The CS process is not finished once the winning decision is announced. It does not matter if the in-house MEO or contractor wins the contract, the government is still responsible for monitoring post-award performance to ensure performance requirements are met, quality standards are maintained, and costs are reasonable. Evaluators must assess performance using the quality assurance plans developed during the A-76 cost study; however, problems are often encountered in this area. As a result, the government may not always receive all required Services in the most economical manner which jeopardizes projected savings and potentially increases costs. Oversight issues range from inadequate surveillance of contractor performance to inefficient MEO operations.

A decade ago, quality assurance programs were routinely identified as problem areas, and it does not appear much has changed. According to one review, the following problems with contractor surveillance were noted:

- Functional area chiefs did not prepare required quality assurance surveillance plans, and some key tasks were not included in the plans.
- Quality assurance evaluators did not always receive required surveillance training.
- Contracting officers did not complete quality assurance checklists or take proper random samples.
- Contracting personnel did not always validate, process, or follow up on discrepancy reports for substandard performance.[40]

Effective contractor surveillance is necessary to ensure the government actually receives what it pays for, and it also allows the organization to evaluate workload requirements. The quality assurance evaluator can discern changes in contractor performance and identify trends in workload requirements by actively managing the surveillance program and analyzing contractor performance reports. These actions allow the contractor to address these areas before they become *showstoppers*.

Quality assurance reviews are not limited to functions that are contracted out. If the in-house team wins the competition, it is also subject to post-award performance reviews. These reviews determine if the in-house activity satisfactorily performed all tasks identified in the PWS and operated within the manpower and resource requirements proposed in the MEO plan. This is another area where projected savings may be impacted, particularly if the MEO exceeds resource requirements or fails to adjust to workload changes. For example, a post-performance review of the training services function at Lackland AFB noted the MEO reflected 19 authorizations, however, 31 personnel were actually assigned to the function.[41] Even if the cost of each additional work year is conservatively estimated at $30K, this function costs at least $360K more than the MEO proposal submitted during the cost study.

The post-performance review of the communications-information flight at Patrick AFB identified potential problem areas as well. The evaluation team was unable to determine if the MEO fulfilled all PWS requirements since workload estimates were vague, not always measurable, and actual workload data was not tracked to substantiate services provided.[42] For example, the PWS identified the workload to monitor and analyze system reports at *1 per day* or the workload to coordinate and process digging permits at *125 per year*; however, these activities were not tracked or documented. As a result, it was impossible to determine actual work completed. As this report noted, "Tracking actual workload data will help evaluate compliance with the management plan and original cost estimates, ensure services are efficiently provided, and facilitate required post-MEO reviews."[43] It will also make it easier to refine the PWS for future competitions, identify tasks that can be eliminated or scaled down, and better link contract performance with actual workload requirements. Each of the preceding examples offers good *lessons learned* regarding areas where cost growth may occur, and personnel contemplating future CS efforts should be aware of these factors.

Limited Visibility into Government Costs

Despite its proficiency in acquiring and employing advanced weapon systems in Operation Desert Storm or the air war over Yugoslavia, the Department of Defense comes under intense fire from all corners when it comes to its financial management and cost-accounting systems. Many of these systems were developed decades ago and do not reflect the latest advances such as activity-based accounting (which is essential for accurately estimating the cost of performing specific tasks). As a result, the DoD's competitive sourcing program suffers the slings and arrows of critics such as Norman Sisisky (D-VA.), who remarked, "Who's kidding whom? I mean, if they can't even balance their books, how in the world can they estimate what they're going to save?"[44] Shortcomings exist in the DoD's workload cost collection systems as well as the master database it uses to track the results of all commercial activities, the commercial activities management information system (CAMIS).

If you asked 50 military leaders what it costs to operate their vehicle maintenance program or billeting operations, it is unlikely any of them could even begin to answer your question. While they might be able to identify their annual operation and maintenance budget for travel and supplies, it is unlikely they would even consider other costs such as military and civilian payrolls, fringe benefits, rents, facility maintenance, plant equipment, or other capital investments. This is not their fault. With the exception of certain functions such as depot maintenance and research laboratories, few military organizations are established as cost centers, and even fewer routinely collect data to track these costs. As a result, many people are surprised when they see the in-house cost estimate and contractor proposals during a cost study. A small function involving ten civilians can easily result in a $500K contract or more! According to a *lessons learned* report issued by the Army, many organizations had to put together several versions of their workload requirements since the data were not readily available, accurate, or supported. These delays can be avoided if the organization begins refining their data collection systems soon after—or even before—they announce an activity as an A-76 candidate.[45]

The DoD's credibility is also called into question because of difficulties in tracking and reporting actual savings in the CAMIS

database. The GAO has repeatedly identified problems with the CAMIS database, claiming it contains inaccurate or incomplete data since the savings, once entered into CAMIS, are not modified and these inaccurate projections are continuously used to support budget submissions.[46] In some instances, the database incorrectly identified competitions as completed when they had not been started, and in other cases, savings projections were not removed from the system even when bases were closed or were realigned. More important, the baseline cost estimates were often lost over time, costs of conducting the cost studies were not included, and actual savings were not tracked or entered into the CAMIS database. Given that DoD's out-year budgets are based on projected savings from CS competitions, it is critical that organizations accurately track these costs so senior leadership can determine if savings have been achieved or if additional funding is required.

Conclusions and Recommendations

The hardest thing to change is organizations that have been successful and need to change anyway.

John White, Deputy Secretary of Defense

With the future of our national defense hanging in the balance, will competitive sourcing prove to be the military's budgetary savior or scapegoat? The jury is still out. Despite vigorous attacks by the Congress, GAO, and internal audit organizations, most people agree the DoD's competitive sourcing program will generate significant savings. The real question is, "How much and when will the savings occur?" Based on insights gained from this research effort, the following recommendations should allow the DoD to better manage the CS process, and hopefully achieve *more* savings *sooner*.

Recommendation 1: establish a well-trained, multifunctional team. A well-trained, multidisciplinary team is absolutely essential for creating an accurate, comprehensive PWS, developing the government's management plan, and conducting the pre- and post-award selection and monitoring tasks. Based on the increasing number of studies and specialized skills needed during cost studies, each major command should assemble full-time *tiger teams* to assist installations during this process. Where possible, the A-76 team should tailor existing performance work statements and quality assurance plans rather than developing them from scratch. This should improve the timeliness and accuracy of the PWS, QASP, MEO, and IHCE; reduce contract lead time; and minimize potential post-award disputes.

Recommendation 2: budget for and hire an independent firm to determine the cost baseline for current operations. Determining the current cost of operations is one of the most difficult and time-consuming tasks associated with A-76 studies. However, it is also one of the tasks that government employees may be least qualified to perform because of unfamiliarity with cost accounting procedures, financial management systems, and cost estimating methodologies. This does not necessarily imply an in-house team cannot develop an accurate baseline cost estimate, but it may be more cost-effective to budget for and hire an independent firm to complete this task. An independent estimate may also foster *buy-in* from potential offerors since it was developed by a third party.

Recommendation 3: solicit early contractor involvement. The government should solicit early contractor involvement in potential outsourcing situations and build partnering agreements with the goal of strategic versus tactical alliances. This approach will avoid the traditional *arms-length* relationship between the government and contractor, improve communication, and promote a better understanding of each party's expectations and capabilities. It also provides opportunities to tailor the contract requirements in such a way as to minimize the costs and risks to both parties.

Recommendation 4: seek flexible pricing arrangements. The contracting officer should aggressively seek ways to incorporate flexible pricing arrangements into CS contracts. This will allow the government to increase or decrease contract payment based on shifting workload requirements; however, the contractor should also be allowed input as to the best way to achieve this flexibility. For those workloads with significant variability, the government may be better off to pay slightly higher prices at contract award in return for predetermined contract adjustments. If this option is pursued, a pricing analyst should conduct a cost-benefit analysis to ensure the government pays a fair and reasonable price for this *flexibility option*.

Recommendation 5: improve budgeting for A-76 studies and contracts. The DoD should fully fund A-76 studies and ensure budget plans properly account for the impact of CS contracts. An A-76 cost study can be a large undertaking, and in many cases, installations may need contractor support to develop the PWS and management plan. Installations should not be expected to pay for these studies *out of hide* since these studies are often downward-directed, and major commands should provide adequate funding to cover these expenses. More important, DoD budget plans should recognize that CS contracts are *must-pay* bills that are subject to Department of Labor and Service Contracting Act mandates. As a result, budget plans should anticipate and reflect funding increases for known labor increases; this should resolve some of the perceptions and funding problems associated with contract cost growth. Major commands should be aware across-the-board cuts in contract funding will unduly penalize those installations that aggressively pursued competitive sourcing. Both MEOs and CS contracts are based on the tasks outlined in the PWS, and reduced funding will necessitate commensurate reductions in Services.

Recommendation 6: recompete functions even if they remain in house. Savings result from competition; therefore, the government should periodically reassess commercial activities to determine if it is receiving the highest quality Services at the lowest price. These *relooks* encourage innovation and efficiencies and offer the opportunity to further improve government operations and reduce costs.

There are no *silver bullets* that will easily resolve all competitive sourcing problems. But any improvement, no matter how marginal, is important since it will enhance the likelihood of increased savings and reduced costs.

Notes

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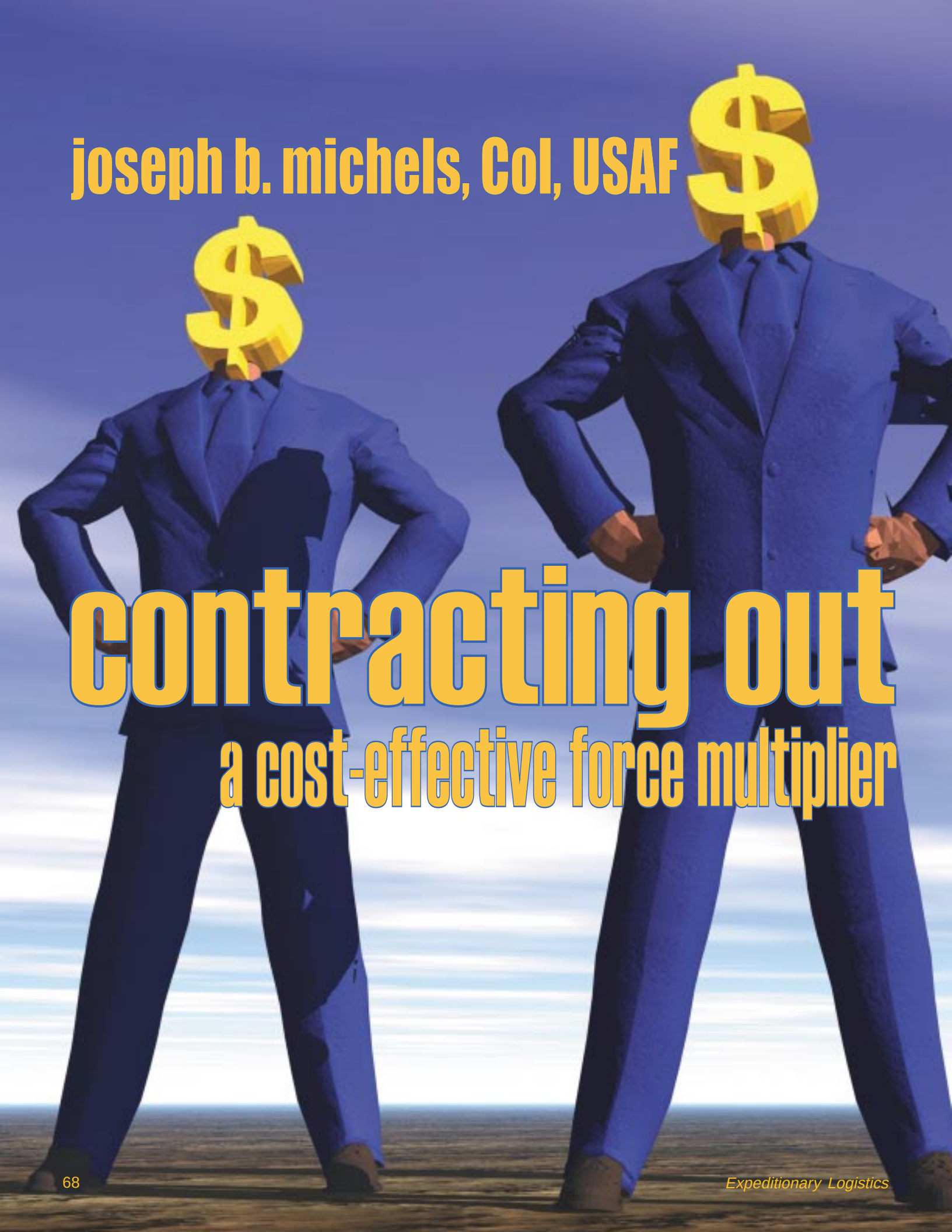
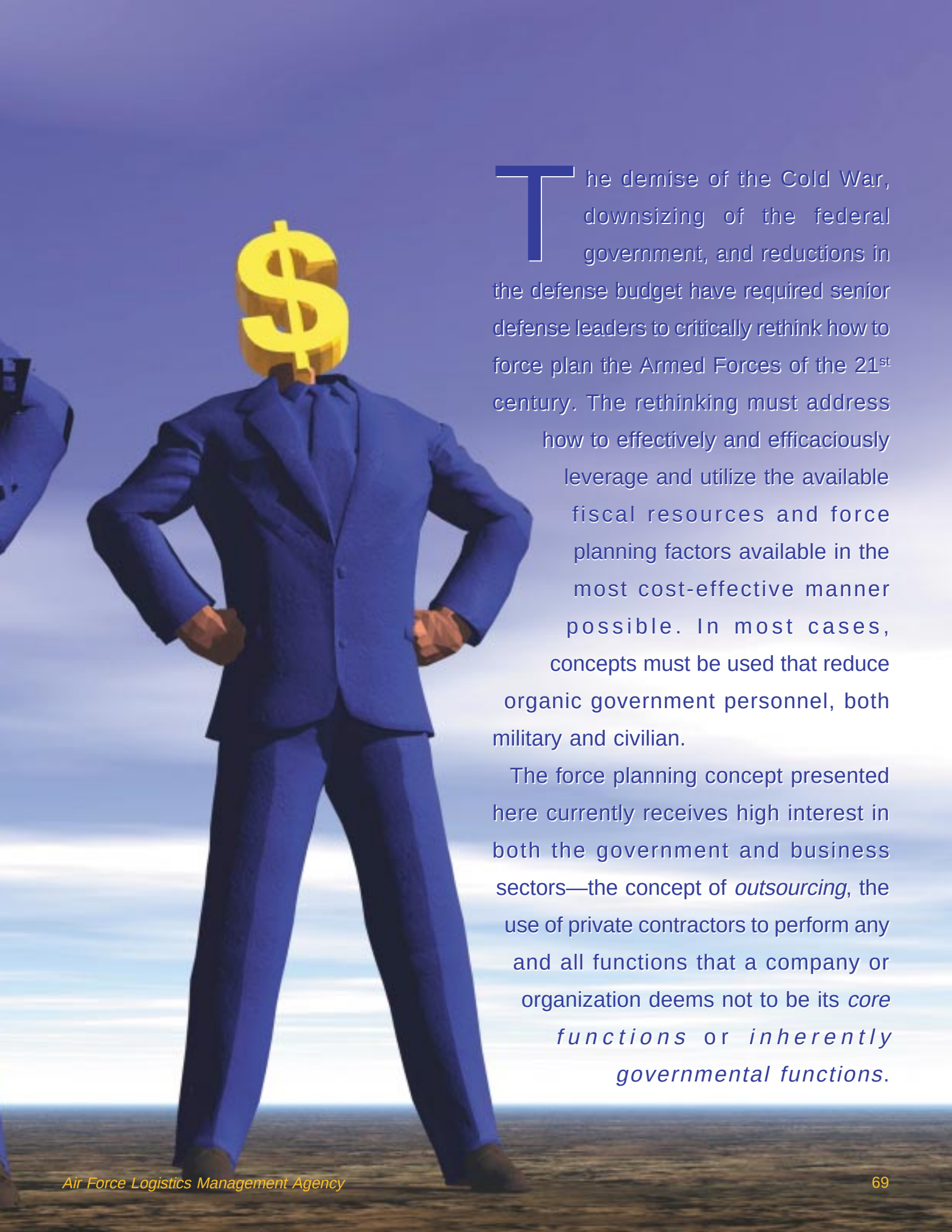


contracting out

a cost-effective force multiplier



The demise of the Cold War, downsizing of the federal government, and reductions in the defense budget have required senior defense leaders to critically rethink how to force plan the Armed Forces of the 21st century. The rethinking must address how to effectively and efficaciously leverage and utilize the available fiscal resources and force planning factors available in the most cost-effective manner possible. In most cases, concepts must be used that reduce organic government personnel, both military and civilian.

The force planning concept presented here currently receives high interest in both the government and business sectors—the concept of *outsourcing*, the use of private contractors to perform any and all functions that a company or organization deems not to be its *core functions* or *inherently governmental functions*.

The federal government deems a function to be *inherently governmental* if the public interest mandates the performance of that function by government employees. Examples of inherently governmental functions include commanding combat troops; conducting foreign relations; and regulating space, navigable rivers, other natural resources, and industry and commerce.[1] Outsourcing is defined as the transfer of a function previously performed in-house to an outside provider.[2]

Many studies[3] have investigated the outsourcing process and identified various factors that result in successful outsourcing contracts. As government enters the 21st century, many senior leaders strongly advocate the use of methods and models that are successfully employed in the private sector but have not been applied extensively in the nonprofit environment such as defense. The presumption of efficiency in the private sector is challenged less forcefully, but the challenges rely on theories of noncompetitive markets, examples of malfeasance by contractors, and concerns for equity when private firms profit from provision of public services.[4] New, innovative methods—*out-of-box* thinking—are required more than at any other time previously in order to achieve the defense mission with the fiscal resources allocated. Creativity and innovation are the keys in today's resource-constrained environment.[5]

These precepts are diametrical to the function of a governmental bureaucracy, especially that of the Department of Defense. As the largest bureaucracy in the federal government, change and innovation are not ideas or concepts easily embraced by entrenched government bureaucrats. Carnes Lord perhaps best described the dynamics of bureaucracy in his book *The President and National Security when he stated*:

> Perhaps the most powerful factor determining bureaucratic behavior is the instinct of organizational self-preservation. Like all other forms of life, bureaucracies tend to pursue survival before all other goals. Also like other forms of life, they tend to be resourceful in adapting in their environment. Bureaucratic entities are, as a result, notoriously difficult to kill off, even after their original reason for being has disappeared. Organizational survival is inseparably bound up in organizational identity.[6]

Changing long-entrenched organizational paradigms, structures, and frameworks is inevitable. The results of these changes will be significant civilian and military personnel reductions, and the expanded use of space age technologies such as computer automation, information technology, robotics, improved work concepts to include job sharing, team basing, and telecommuting. Change is never easy, but significant and substantial change is required if governmental efficiencies are to be achieved and cost reductions attained. To do less is unthinkable, especially in today's resource-constrained environment.

The mindset of senior defense leaders must be focused on not only achieving and accomplishing the operational mission but also possessing a greater understanding of the business perspective in how the operational mission is accomplished. A significant understanding of activity based costing (ABC) is necessary, for ABC provides cost activity level detail of all costs associated with the performance of a specific functional area. This cost understanding is crucial when investigating other methods of mission accomplishment, specifically the use of contractors to perform tasks previously accomplished by military or civilian personnel. For a valid cost comparison to be realistic, the contractors' and government's bids must be based on the identical work requirement and specifications document. This document must be an in-depth description of the required quality and quantity of work, level of service, and time restrictions on the work. [7]

Background

The *reinvention of government* that was the battle cry of the Democrats during the 1992 Presidential election has become a *watershed* event in making government more efficient, more cost effective, and less bloated. Most people agree that the advent of technology, elimination of outdated and outmoded work rules and use of private sector methods can improve service delivery of government functions.

Competition by the government with the private sector in performing services that are not inherently governmental in nature has been expressly prohibited since the middle of the Eisenhower administration. *Bureau of the Budget Bulletin 55-4* expressly prohibits such functions:

> The federal government will not start or carry on any commercial activity to provide a service or product for its own use if such product or service can be procured from private enterprise through ordinary business channels. [8]

Acquisition policy contained in *Federal Acquisition Circular 90-29* confirms the same basic position:

> It is the policy of the government to A) Rely generally on private, commercial sources for supplies and services, if certain criteria are met while recognizing that some functions are inherently governmental and must be performed by government personnel.[9]

The report of the Commission on Roles and Missions of the Armed Forces was very explicit in suggesting that outsourcing be considered a high priority of the Secretary of Defense.[10] The report made the following recommendations regarding outsourcing of defense functions:

> The Secretary should direct outsourcing of existing commercial-type support activities and all new support requirements particularly depot level support of new and future weapons systems. [11] We believe the potential benefits of outsourcing essentially all wholesale level support for weapons systems should receive greater priority than consolidation of the management of just their repair parts. [12]

The commission further recognized that outsourcing is not a universal remedy for all government [defense] matters: "Government to retain core functions to protect the public interest—These functions described as inherently governmental. . . ."[13]

In light of the many reports, studies, and interest regarding government efficiency improvement, coupled with a declining fiscal resource base, the prudent person must believe government should begin and continue aggressive actions toward outsourcing. An initial starting position to begin outsourcing actions is those functions performed by the government that are identified as commercial activities. Table 1 identifies defense activities labeled as commercial activities:[14]

Although the activities identified in Table 1 expressly identify DoD activities, this same list can be applied to most, if not all, civilian government departments and agencies.

Social Services	Health Services
Research, Development, Test and Evaluation Support	Base Maintenance/Support Services Real Property Maintenance
Education and Training	Product Manufacturing
Data Processing	Equipment Maintenance

Table 1. Commercial Activities

The Defense Department has made progress in outsourcing, although much is left to be done. Table 2 identifies the DoD commercial activities that are currently outsourced and the amount outsourced.[15]

DoD Commercial Activity	Percentage Outsourced
Base Commercial Services	25
Depot Maintenance Activities	28
Finance and Accounting	10
Army Aviation Training	70
Surplus Property Disposal	45
Parts Distribution	33

Table 2. Amount of Outsourced Commercial Activities

The cost savings achieved through privatization normally result in work force reductions since the contractor is able to perform the same task with fewer people. For military-related tasks, elimination of military billets provides significant cost savings.[16] International experience with defense privatization in Great Britain yielded cost savings of 15-20 percent for defense programs and 25 percent for domestic programs.[17] However, there is *no free lunch* regarding contracting out. Costs initially associated with outsourcing initiation may be as high as 10 percent of the overall contract value. Annual cost savings may approach 30 percent over the term of the outsource contract—money that is recouped in 3 to 4 months after contract initiation.[18]

Government's failure to accurately collect all functional cost elements associated with a particular function is detrimental when outsourcing is considered. Inadequate, outmoded, and nonfunctional government accounting and record-keeping systems fail to provide the *level of granularity* necessary for true cost analysis. The use of ABC should be considered to identify and capture all related cost types. The relevant categories of costs that should be examined include such direct and indirect costs of production as personnel, utility, equipment, material, client, contract administration and inspection, conversion, and gains or losses on the government's disposition of capital assets. In addition, relevant social costs incurred by contracting out should be examined such as equity losses, reduced community participation and diminished managerial control or diminished government sovereignty. [19]

Closely associated with ABC are definition and identification of the actual requirement to be performed by the contractor. *Gold-plated* requirements are normally identified as necessary when contrasted with what is really required for normal day-to-day operations. Without a true understanding of the actual costs involved, it is very easy to agree with gold-plated requirements, oftentimes at a significantly higher cost than necessary.

The relationship between contract price and contract value is another factor that must be carefully considered when outsourcing. The *lowest price* is normally not associated with the *best value* of the contract benefit. Although not a direct linear function, the cost value utility curve in Figure 1 provides a graphic portrayal of the cost-value relationship.

The best value point is established where the marginal increase in cost fails to yield a significant increase in contract value: some increased marginal cost will provide greater value. Hence, the lowest price received through competitive contract selection is not normally the best value. The *best value* point of a particular function is determined after a complete understanding of the activity-based costing process.

In order to achieve best value outsourcing, the performance expectations of the contractor must be clearly identified by the government. Key, critical satisfaction indices should be plainly identified by the government. These satisfaction indices must address what the government considers satisfactory contractor performance. The government should clearly identify what needs to be performed, not how. Once government satisfaction indices have been clearly identified and all offerors understand the requirements, the solicitation should be conducted, the contract awarded, and the outsourcing contractor allowed to begin work. At this point, the government should allow the contractor to figure out how to fulfill the terms of the outsourcing contract, without extensive compliance checking and contract oversight.[20]

Extensive government contractor oversight and compliance checking may negate many of the cost savings. Although some personnel who performed the function may be replaced, other government personnel who monitor the contractor are necessary. Some contractor monitoring is essential in ensuring that the *best value* is being received by the government for the work of the contractor. The key critical issue is the amount and type of contract instrument employed. The cost of contract monitoring is important, because it adds to the overall cost of the outsourcing experience. [21] The contractor must be given enough freedom to perform the contractual requirements; however, the government must ensure that the contractor is indeed complying with the statement of work. This is a delicate balancing act in which trust and understanding are required by both the government and the contractor.

The various initiatives of defense acquisition reform conducted by the Clinton administration—to include the Federal Acquisition Streamlining Act of 1994, the Federal Acquisition Reform Act of 1996, *DoD Directive 5000.1*, and *DoD Regulation 5000.2*—enabled significant changes to DoD's procurement of goods and services.[22] These legislative initiatives allow additional force cut reductions without any lost value to the government. Acquisition reform achievements made during the Clinton administration have focused significantly on removing many of the *adversarial* positions experienced between government and contractor personnel. Initial indications of using these streamlined procedures obtained from a wide variety of

government agencies strongly suggest that many of the reforms are experiencing a modicum of success. Collaborative *partnerships* between government and industry are playing a greater role today than ever before. This is good; however, an *arm's length* distance must be maintained between both government and contractor. Although trust is paramount in the collaborative partnerships, this is a business relationship and must be maintained as such. Adversarial relationships do not need to be maintained; however, *sweetheart* relationships have no part in ensuring the best value is obtained.

Military skill training is important at all times, especially during wartime. All of the DoD commercial activities identified in Table 1 are required during wartime. If these activities and functions are outsourced to a civilian contractor, how will the military maintain skill proficiency during wartime? This is a critical question that must be addressed from a force planning standpoint. In order to ensure military troop proficiency, tasks done at stateside bases identified as DoD commercial activities are also tasks normally performed in a wartime and overseas environment. With the demise of the Cold War, US military forces have become more frequently involved in *brush fires*, peacekeeping operations, and civil defense activities such as firefighting and hurricane and flood relief assistance. If a military task has been outsourced and those skills are necessary for war or disaster assistance, the military member will not be able to maintain skill proficiency in the assigned military task. All DoD commercial activities located at stateside bases could be considered for outsourcing, thereby displacing military personnel. If this occurs, military personnel encounter an unfavorable overseas rotation indice, meaning there is an imbalance between the amount of time a member spends aboard ship or serves in an overseas theater and the duty time in the Continental United States (CONUS). Significant here is family tranquillity, for in today's Armed Forces, many lower ranking enlisted personnel are married, with one or two infant or preschool children. Long periods of overseas deployments without the family or accompanied overseas tours with the family many thousands of miles from loved ones creates a morale issue that is often times larger than just the cost savings realized by commercial activity outsourcing. Long-term personnel retention and recruitment of new military members must also be weighed instead of just government cost efficiency. These quality-of-life concerns suggest that the selection of those commercial activities to be considered for outsourcing also consider troop skill proficiency as well as cost.

The Strategic Outsourcing Model employs a systematic paradigm to identify and ascertain which commercial activities are suitable for outsourcing. The model is currently developed at the strategic level and allows senior decision makers to do a sensitivity analysis between various outsourcing options. Consideration is given to both unique military training requirements as well as overseas rotation indices' imbalances.

Strategic Outsourcing Model

The Strategic Outsourcing Model (Figure 2), provides a systematic paradigm for beginning outsourcing of commercial activities. This model is developed at the strategic level and provides a simple, yet effective, model to initiate outsourcing actions.

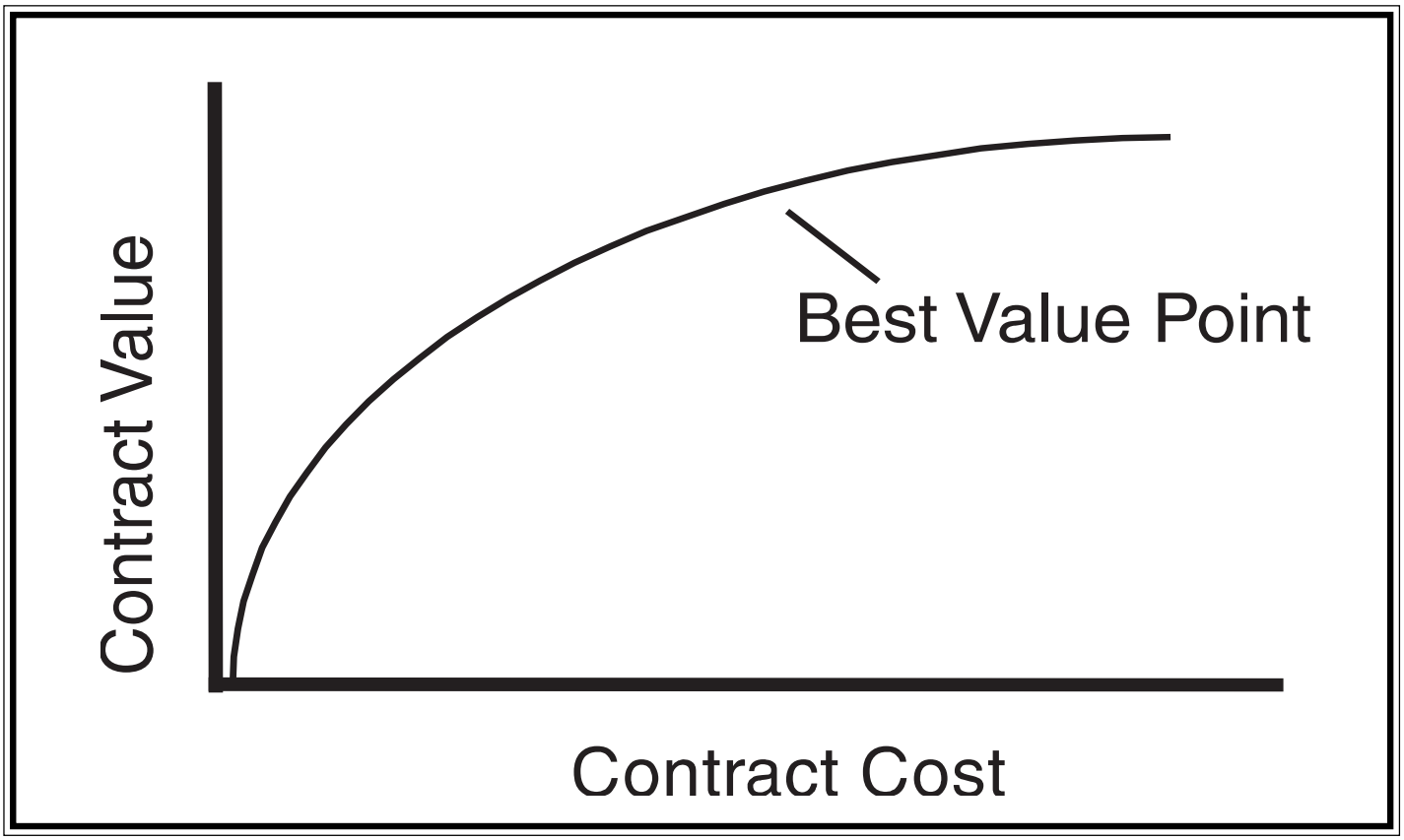


Figure 1. Cost-Value Utility Curve

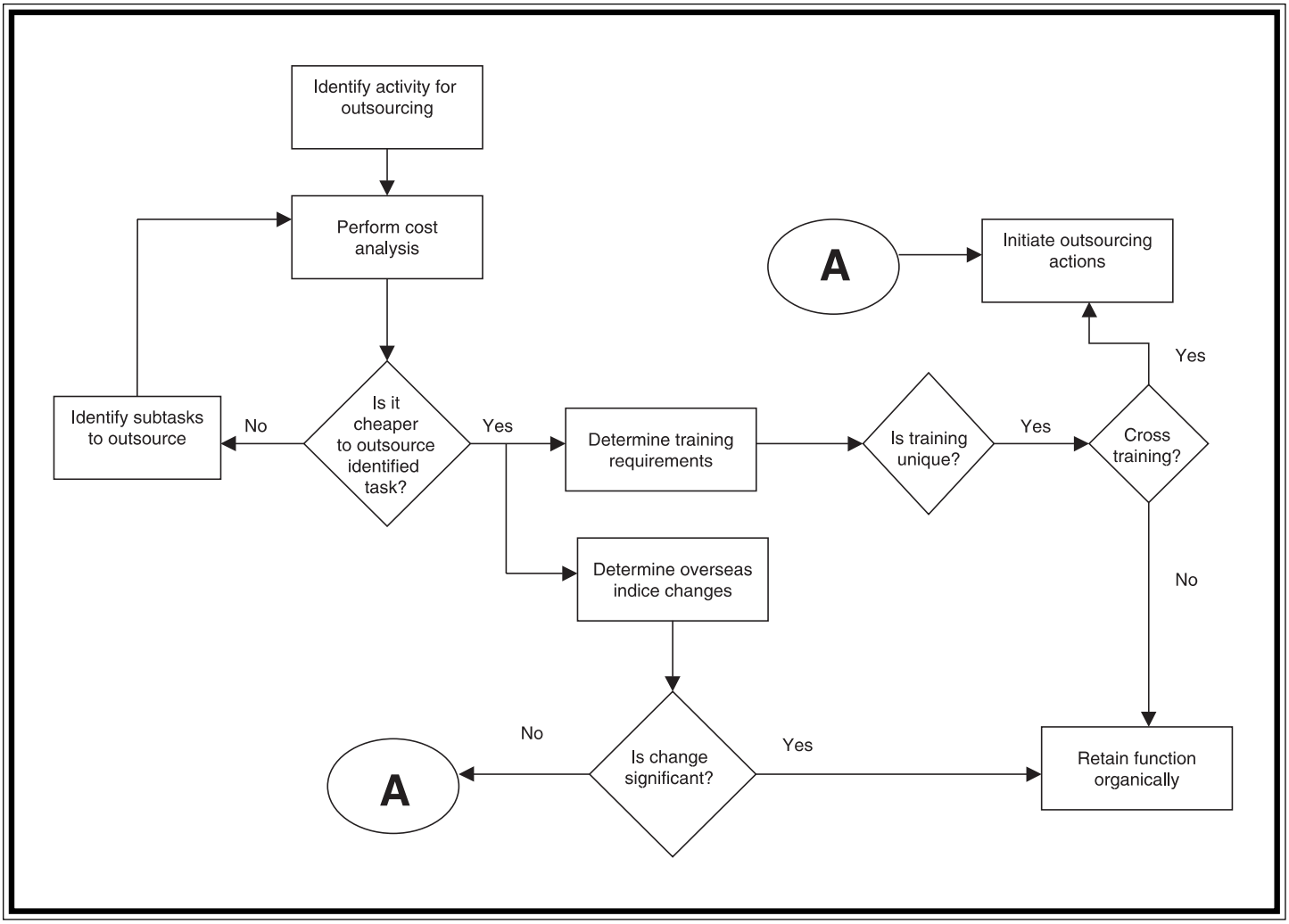


Figure 2. Strategic Outsourcing Model

Cost Analysis

Once a commercial support activity identified in Table 1 is considered for the possibility of outsourcing, a complete cost analysis (using ABC principles) is conducted. All of the various cost categories identified earlier should be addressed. The cost estimate should be as detailed and complete as possible, ensuring that all organic cost categories are included. Once the data are obtained, a proposed contractor cost estimate is required. Depending upon the size and complexity of the contract, many cost estimates may be received. Comparison of both the government cost estimate and the proposed contractor cost estimate is needed. This task is done by an integrated process team (IPT) including the contracting officer, financial analysts, managers of the perspective outsourced activity, and the director of small business. This task is time consuming and very detailed; however, once all the costs are identified, comparison of differences can normally be done by spreadsheet analysis.

If through the cost comparison analysis, the commercial activity can still be performed cheaper by the government, another subtask identification iteration should be performed to identify subtasks that may be outsourced. This is an iterative process, the goal being to identify those activities or subtasks of an activity in which outsourcing can be accomplished. Once this action is complete, the next step is determining training requirements and overseas indice changes.

Training Requirements

This phase of the outsourcing model is conducted by another IPT composed of training development specialists, personnel managers, and functional managers of the proposed outsourced activity. The critical step here is to identify what, if any, training requirements are so unique to the military or government that, although prima facie, it may appear outsourcing is cost effective, when in reality, it is not. Specialized training requirements that military members obtain may be so costly and unique that the amount of *sunk costs* the government has expended dictate that not outsourcing the activity is best, although it may be economically cheaper to outsource. If the training is determined to be unique, a test must be done to see if *cross training* can be achieved. In this step, all training actions are identified and cross-referenced to similar military tasks performed by military members. Depending upon the correspondence of matrixed actions, for example, how many identified training actions are currently being done by other military members would determine if cross training is feasible. Task complexity, ease of learning the task, and frequency of cross-training are all factors

that must be considered. In most of the commercial activities listed in Table 1, this should not be a substantial problem, however this step must be completed to ensure completeness of actions.

Overseas Indice Changes

Another IPT must determine if outsourcing an identified commercial activity would cause a significant imbalance in overseas rotations of military personnel. With more frequent overseas deployments and increased operations tempo since the demise of the Cold War, family separation and deployment length are significant considerations in many military members' desire to remain in the Armed Forces. *Significant* is purposely not defined in this model since no one indice applies to all Services equally. The Air Force currently is trying to ensure that Air Force members are not deployed more than 120 days in any 365-day period.

If an outsourcing action negates requirements for military members service in the CONUS, strong consideration must be given to ensuring that these military members have a job stateside. This can be done in a variety of ways. Cross training, homogeneous job enrichment, and secondary skill identification are all ways in which members can perform both their primary military skills and still have an equitable balance between overseas and CONUS assignments. The overseas indice change and training requirements are dual tracked. This is not just coincidental. Both the training requirements and overseas indices are major factors in addition to the cost, that should be addressed in an outsourcing action. However, wartime readiness, force mobility, and the ability to have trained personnel available in time of conflict are the paramount tangential considerations that must also be addressed. If the overseas rotation indice change is deemed to be significant, the commercial activity should continue to be performed organically by the government. However, most, if not all, of the tasks identified in Table 1 should be able to be successfully outsourced.

Conclusion

The Department of Defense should immediately begin outsourcing all of the commercial activities identified in Table 1. Each Service should identify at least five different candidate locations. In order to ensure the widest spectrum of various and different activities are chosen for implementation, each Service should certify that the locations identified are totally representative of the activities of that particular Service. Identification of *cross-training* activities should ensure that no formal school costs are incurred for military personnel who will require cross training. The study should be run for 8 months, then reviewed.

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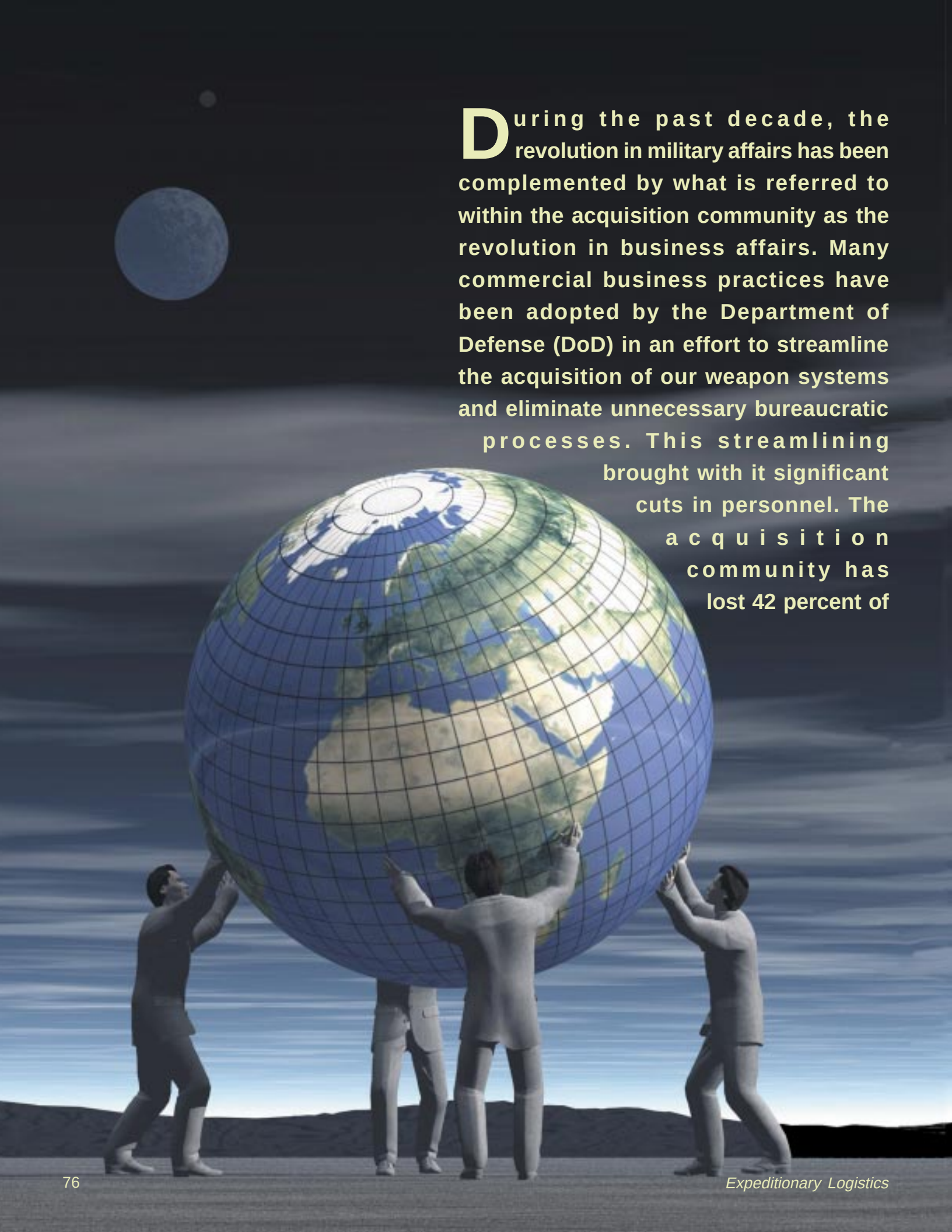
notable quotes

The battle is fought and decided by the quartermasters before the shooting begins.

Field Marshal Erwin Rommel



During the past decade, the revolution in military affairs has been complemented by what is referred to within the acquisition community as the revolution in business affairs. Many commercial business practices have been adopted by the Department of Defense (DoD) in an effort to streamline the acquisition of our weapon systems and eliminate unnecessary bureaucratic processes. This streamlining brought with it significant cuts in personnel. The acquisition community has lost 42 percent of

its work force since 1989, and further reductions are planned.[1] In addition, personnel cuts across the armed services have left military leaders struggling to ensure operational readiness for the multitude of operations they will face in the 21st century.

As the Department of Defense continues to employ commercial practices to revolutionize its acquisition and sustainment processes, the reliance on contractor support for its weapon systems is rapidly increasing. Defense and commercial contractors perform such an extensive role in support of military equipment that many critical systems cannot be operated without them. Investments in the specialized training required to maintain these complex, sophisticated weapon systems is not *economical* for the military. However, these economies need to be balanced with the risks faced by battlefield commanders in the event contractors are not available to maintain deployed systems.

Contractor/civilian personnel have been an integral part of military operations since the American Revolution. In today's environment,

contractor support on the battlefield

Risky Business

kim nelson, Maj, USAF

however, the role of the military has significantly changed. Now much of the force structure serves as a coalition partner supporting military operations other than war (MOOTW). This sheds new light on the use of contractors, as they may be called upon to support military missions under battlefield conditions during nonwar operations. MOOTW introduces a host of legal and regulatory issues that must be addressed prior to subjecting civilian personnel to hostilities. Currently, acquisition training courses for program managers are virtually devoid of information with respect to these issues.

The acquisition and contracting communities must adapt to these changes in force implementation and develop processes to train program managers and contracting officers to effectively structure program support strategies accordingly. Future programs and contracts must ensure weapon systems are designed, developed, produced, and sustained with both contractor and military support in mind. Support contracts must be flexible enough to withstand the uncertainties faced in the battlefield and, at the same time, guarantee readiness. Operational forces cannot afford the risk of a contract dispute that leaves them vulnerable and unable to carry out their mission requirements.

Background

In total war, it is quite impossible to draw any precise line between military and non-military problems.

Winston Churchill

As America ventures into the 21st century, the military faces increased responsibilities all over the globe. Military missions cross the entire spectrum of crisis intervention, from humanitarian assistance to peace operations to high-intensity conflict.[1] This increased responsibility has been coupled with an extensive decrease in force structure. In just the last 15 years, the Armed Forces have suffered a 30 percent loss in manpower along with a 40 percent cut in the defense budget and a 70 percent reduction of weapon systems acquisition. In addition, the US has withdrawn two-thirds of its ground forces and three-fourths of its air forces from Europe, leaving a large void in the logistics infrastructure available for conducting overseas operations.[2] In view of these reductions, many tasks once performed by military members have been contracted out to private industry.

According to the *Office of Management and Budget Circular A-76*, activities ranging from laundry services, to aircraft maintenance, to satellite tracking and data acquisition can be acquired through commercial sources. With this in mind, virtually any task appears acceptable for contracting with private industry. However, activities that are "so intimately related to the public interest as to mandate performance by government employees" are not subject to contracting out. These include "management and direction of the Armed Services, and activities performed exclusively by military personnel who are subject to deployment in a combat, combat support, or combat service support role."[3] Unless Congress has declared war, civilians cannot be legally required to serve in combat situations. For this reason, military activities involving deployment to combat zones are considered government functions and must remain organic to the military. Organic activities include the actual weapon system operations and the logistics support capabilities required by those systems.

Core Capabilities

To ensure effective maintenance support for deployment locations, the Services are required, by law, to maintain a core logistics capability. According to Title 10 US Code 2464, a core logistics capability includes "those capabilities that are necessary to maintain and repair the weapon systems and other military equipment."[4] Contractors cannot serve in a combatant role. As a result, maintenance capabilities must remain organic to ensure combat readiness in the face of hostile action.

It is essential for the national defense that the Department of Defense maintain a core logistics capability that is government owned and operated to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to mobilization, national defense contingency situations, and other emergency requirements. [5]

Improvements in the reliability and maintainability of weapon systems over the last 20 years have helped the logistics work force reduce repair times and maintain mission readiness. However, technology has advanced far beyond the military's ability to train sufficient personnel to support these weapon systems. Operation and maintenance of state-of-the-art systems often requires extensive knowledge of system design, an expertise not readily available within the military ranks. This increased sophistication of weapon systems places a greater need for knowledgeable technicians to be close at hand during operations, thereby increasing the risk of civilian contractor involvement in conflict.[6] As recently as Desert Storm, contractors were called upon to provide in-theater aircraft maintenance, transport and supply, thus straining the definition of essential military skills.[7] In Operation Desert Storm, 76 US contractors deployed with 969 military members to provide maintenance, technical assistance, and equipment support. A few even went into Iraq and Kuwait with combat elements.[8]

Since commanders are trained to do whatever it takes to effectively carry out the mission, they may be compelled to use personnel from any available source. However, even during a crisis situation, commanders must adhere to the laws regarding the maintenance of core capabilities and employment of civilian personnel. As outlined in DoD product support strategy, "Although each service has developed its own core definition and assessment process, the bottom line is that any action to outsource a logistics function that causes loss or sufficient weakening of a core capability, as defined under 10 USC. 2464, does not meet the intent of the law."[9] To help address the problems encountered during Desert Storm and maintain force readiness in a changing strategic environment, the Joint Chiefs of Staff developed a flexible new concept for employing the military instrument of power, one that specifically addresses the requirement to develop a more responsive logistics capability.

Focused Logistics

Joint Vision 2010 addresses four key operational concepts designed to effectively fight and win America's battles of the

21st century: Dominant Maneuver, Precision Engagement, Full-Dimensional Protection, and Focused Logistics.[10] Focused Logistics is "the fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while en route, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations."[11] Or, as more succinctly defined in the *1996 Logistics Support Plan*, a capability that is "flexible, mobile, integrated, compatible, and precise in targeting support to the point of need."[12] The JCS expects defense agencies to "work jointly and integrate with the civilian sector, where required, to take advantage of advanced business practices, commercial economies, and global networks."[13]

Business contracting processes are not restrained by the numerous laws and regulations imposed on government contracting; hence, the improvements expected from the implementation of commercial practices are not always realized. Furthermore, business approaches cannot be directly applied to many of the missions the military that executes. While civilians can readily accomplish aircraft maintenance in the Continental United States, they cannot be required to accompany the aircraft into combat zones. A lack of support will leave combatant commanders unable to execute the required mission, an unacceptable end product of outsourcing. "As much as we try to emulate and adopt commercial best practices, there will always be a noncommercial, unique warfighting aspect to the majority of DoD weapon systems."[14] Organic logistics capabilities must be maintained to support the battlefield commanders, ensure operational readiness, and successfully implement the concepts of Focused Logistics.

Issues Analysis

> *Sound logistics forms the foundation for the development of strategic flexibility and mobility. If such flexibility is to be exercised and exploited, military command must have adequate control of its logistics support.*
>
> **Rear Admiral Henry E. Eccles**

The Department of Defense has successfully applied commercial practices across a broad range of functions. While this is a positive step, not all commercial practices provide a best-value service to the military. In fact, over utilizing these practices can negatively affect military readiness in time of conflict. While the DoD has relative freedom to contract non-warfighter functions—those performed *outside* the theater of conflict—functions performed in-theater must remain organic to military personnel. This decision is based on problems associated with using contractors on the battlefield.[15]

As previously noted, civilian contractors accompanied US troops onto the battlefield during Desert Storm. Operations in Somalia, Bosnia, and Haiti also saw employment of civilian personnel in hostile environments. This level of involvement creates multiple, complex issues that the combatant commanders must address before the contractors arrive in theater. These issues directly relate to the basic tenets concerning the proper conduct of military operations. These proven truths are known as the Principles of War.

Principles of War

The Principles of War apply to military operations at the strategic, operational, and tactical levels of war. According to Joint Pub 3-0, unity of command, objective, offensive, mass, maneuver, economy of force, security, surprise, and simplicity are the "enduring bedrock of US military doctrine."[16] Use of civilian contractors on the battlefield violates the purpose of these principles, specifically with respect to unity of command, security, and simplicity.

Unity of Command

"The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective."[17] Joint Pub 4-0, *Doctrine for Logistic Support of Joint Operations* states, "Unity of command is essential to coordinate national and theater logistic operations. For a given area and for a given mission, a single command authority should be responsible for logistics."[18] Military personnel are subject to the *Uniform Code of Military Justice* (UCMJ) and obey the lawful orders of the commanders in charge. Civilians, on the other hand, do not follow this command structure unless Congress declares war, an action not taken since World War II. As stated in Title 10 USC, civilian personnel subject to the UCMJ must meet the following criteria:

> In time of war, persons serving with or accompanying an armed force in the field … and subject to any treaty or agreement to which the United States is or may be a party or to any accepted rule of international law, persons serving with, employed by, or accompanying the armed forces outside the United States.[19]

This lack of command authority over civilian contractors places a burden on commanders. Commanders must now weigh the legality of their decisions against a contract before giving orders. This leaves room for contractor personnel to refuse tasks that do not meet contractual requirements. The lack of command authority over contractor maintenance personnel assigned to the Operational Support Agency during Desert Storm resulted in mission success becoming dependent on whether or not requested support aligned with the contract.[20]

Once commanders ensure orders will come under the purview of the contract, they may face another dilemma. Contractor personnel can refuse to carry out the orders of the commander. Since military law only applies during a declared war, the commanders' hands are pretty much tied. As it stands now, their only recourse is to "have the contracting officer direct a contractor to remove an employee who does not conform."[21] Unfortunately, the commander's request still remains unfulfilled. This problem is exacerbated by the fact that commanders are often unprepared to deal with this type of situation. Regulations regarding civilian deployment and mobilization plans fail to address those unique aspects of deployment associated with non-DoD personnel. "According to a study performed for the Army by the RAND Corporation in 1994, there has never been a central policy for deploying contract employees."[22] Hence, while attempting to conduct operations in threatening, hostile environments, commanders face a loss of control over their in-theater weapon system support personnel. This loss of control, inherent to the military-civilian relationship, may result in defeat, depending on the criticality of the functions performed and the inevitable fog and friction introduced during battle.[23]

Military authority over civilian personnel is virtually nonexistent without a formal declaration of war, a declaration that is unlikely considering the strategic environment facing today's military. The DoD currently plans for "a near-term future in which regional conflicts persist but which is devoid of a major military threat as characterized by the 45-year Cold War."[24] In this volatile environment, commanders will need to take additional steps to maintain unity within their command. During Desert Storm, some civilian contractors *just said no* when asked to accompany the military into harms way, leaving a void in the logistics support structure. This refusal would be unheard of in the military command structure, not so with civilian personnel. These contractor employees did not sign up to "defend against all enemies foreign and domestic," so it is difficult to condemn them for a lack of patriotism or commitment. As one author noted, after conducting extensive research on operational support during Desert Storm, "The fact that some civilian contractors refused to deploy to the war zone should not have surprised anybody. This problem itself is enough to consider replacing the contractor logistics support (CLS) system with Air Force maintenance personnel."[25] Statements such as this clearly outline a need to determine the military commander's authority to direct civilian personnel supporting the operations.

A detailed list of the functions performed by contractor personnel, integrated with other operational considerations, will provide the commander valuable information on which aspects of the operation are under the commander's direct command. This information will greatly assist in accomplishing an overall risk assessment of the situation and in driving alternative support concepts, such as training additional military personnel to fill potential vacancies. US forces must either learn to perform these functions or risk an inability to deploy.[26] Additional considerations, such as the potential to encounter weapons of mass destruction, only serve to magnify the risk of civilian nondeployment and further hinder the commander's ability to wage war.

In the mid-1980s, a scenario involving the use of chemical and biological (CB) weapons against US forces was presented to 21 general officers to obtain their assessment on the impact the attack would have on joint operations. The study concluded the following with regard to civilian personnel located in hostile territory:

> We believe there would be a significant reaction to CB attacks by the civilian and contractor work force . . . resulting in a great reluctance to return to work . . . Specifically, we could not predict the availability of a civilian and contractor work force to return to previously contaminated areas and resume work . . . Even where subsequently given chemical defense gear and trained in its use, it is reasonable to estimate a minimum 30 percent degradation in worker availability and effectiveness.[27]

A loss of 30 percent effectiveness, resulting from an over-reliance on a civilian work force that is vulnerable to CB weapons illustrates a weakness in the US power projection and force buildup capability.[28] During Desert Storm, efforts were taken to help alleviate the fear of attack against civilian personnel and encourage them to remain in theater. The C-21 maintenance contractors were separated from military forces and housed in downtown Riyadh.[29] While this decreased their vulnerability to attack, it also separated them from the aircraft they maintained and the commander they served, further affecting the overall unity of command. Moving the contractors also attacked the principle of security as it raised issues concerning the military's ability to adequately protect them from enemy aggression.

Security

"The principle of security requires that friendly forces and their operations be protected from enemy action that could provide the enemy with unexpected advantage."[30] To date, the DoD has not fully addressed the problem of hostile action aimed at contractor personnel. In the past, contractor personnel could remain fairly close to friendly lines and conduct their mission at a relatively safe distance from battlefield operations. However, revolutions in technology, to include advanced weaponry, all but eliminated the concept of the linear battlefield.[31]

Joint Pub 1-0, *Doctrine for Personnel Support to Joint Operations*, states, "DoD civilians and contractor employees deployed for military operations will be provided the same support and services provided their military counterparts." Furthermore, "component commanders will provide the necessary resources to support, train, clothe, equip, and sustain the civilian work force in the operational area."[32] Standard procedures for military personnel include regular training and vaccinations to ensure immediate deployment capability. Therefore, commanders must ensure civilian contractors have received their required vaccinations and special training (for example, Self-Aid Buddy Care and Chemical Warfare) and be prepared to provide this training prior to allowing their entry into theater. For the most part, civilian agencies do not incorporate warfare training as part of their formal instruction programs. Civilian participation in battlefield operations not only presents the commander with additional protection considerations, but also brings civilian coverage under international agreements into question.

As members of a land-based service, Army personnel are fairly likely to come into direct contact with the enemy. For this reason, providing security to civilian personnel is incumbent upon Army commanders more so than any other Service. The Army has been wrestling with the issue for some time and has published policy for employing contractors on the battlefield. Field Manual 100-10-2, *Contracting Support on the Battlefield*, and AR 715-XX, *Army Contractors on the Battlefield*, attempt to define procedures for commanders faced with protecting civilian personnel. While these documents provide a good overview of the courses of action available to commanders using contracted support, they fail to fully clarify the protected status of civilians in the event hostile forces are encountered.

Contractor employees accompanying US Armed Forces may be subject to hostile action. If captured, a contractor's status will depend upon the type of conflict, applicability of any relevant international agreements, and the nature of the hostile force… The full protections granted to prisoners of war under the Geneva and Hague Conventions apply only during international armed conflicts between signatories to those conventions. Accordingly, these conventions are generally nonapplicable during MOOTW. Therefore, contractor employee protection during MOOTW will depend on the specific circumstances of an operation. [33]

Combatant versus noncombatant status must be clearly defined and legally supported prior to deploying contractor

personnel into potentially hostile environments. Uncertainty presents an unacceptable risk. In the event of capture, contractors may face incarceration or death depending on their status and level of involvement. If the US fails to properly define their status, they will more than likely be at the mercy of the enemy. DoD documents drafted as recently as August 1999 state that contractors create *concerns* regarding status of forces agreements and ask (rather than answer) the question, "Once civilians enter hostile territory, are they protected from attack or not? Are they entitled to protect themselves if threatened?[34] Even though these issues apply to international law probably more so than to service doctrine, the DoD clearly needs to do more to clarify the status of contractors on the battlefield, especially in light of the current strategic environment and its focus on MOOTW.[35]

Status of forces presents one security risk to the commander, and force protection presents yet another. Even in situations where the US considers civilians noncombatants, their support of US operations may be seen by the enemy as active involvement in the conflict and subject them to direct or indirect attack.[36] Unit commanders authorized to use civilian contractor personnel are legally responsible for their protection. To help minimize the risk of attack, the commander must assign ample security force protection to civilian personnel. He can also take more drastic steps to better ensure their safety. According to Joint Pub 1-0, "Civilians deployed to the operational area may be regarded by the enemy as combatants; therefore, combatant commanders may authorize the issue of weapons to DoD civilians and contractor employees on a by-exception basis for personal protection."[37] The arming of contractor personnel obfuscates the distinction between military and civilians serving on the battlefield and challenges their noncombatant status. The confusion surrounding status of forces and force protection issues leads to a discussion on a third principle of war, the principle of simplicity.

Simplicity

The Air Force Doctrinal Document defines simplicity as "avoiding unnecessary complexity in organizing, preparing, planning, and conducting military operations." It also recognizes the complexity inherent in military operations, particularly joint operations, and recommends overcoming complexity through joint exercises and training to gain familiarity with proper procedures.[38] The complexities involved with deploying contractors on the battlefield shatter this concept of simplicity. Military training exercises, by design, do not account for all the maintenance and support provided by contractor personnel. This lack of training can lead to difficulties in conducting operations once forces are deployed and reliance on civilian personnel becomes evident. Joint Pub 4-0 stresses the need to train as a complete unit. "If leaders do not create and train an organization in peacetime that will work in war, the leadership will be burdened with urgent reorganization and training requirements at a time when they should be free to focus on the employment of that organization."[39] Joint Pub 4-0 also describes the ideal logistics organization as one that "would not require a fundamental change to manage the transition from peace to war to meet an emergency."[40] Current military organizations do not contain this ideal logistics organization, as fundamental changes will be required should civilians deploy without proper joint training or, worse yet, be unable to deploy.

Hazardous conditions and international laws that prohibit US civilians from entering certain countries contribute to the readiness issue. In the event contractors are unable to deploy or can no longer provide their services, the entire logistics organization for those supported units would be disrupted at a crucial moment. This disruption would diminish the unit's operational readiness and place an even greater burden on the commander and the troops. Faced with the absence of civilian personnel to perform required functions, commanders may attempt to increase overall combat effectiveness by realigning their organic resources to meet critical demands. However, measures taken to enhance combat power, such as shifting logistics manpower into combat units, may achieve just the opposite effect and upset the proper balance between logistics and combat forces, a balance crucial to conducting military operations.[41] Commanders at all levels must be prepared to deal with this situation and maintain proper balance despite the circumstances. Unfortunately, current doctrine makes it extremely difficult for commanders to prepare, as it fails to address the inevitability of contractor presence (or lack thereof) on the battlefield, especially with respect to the strategic environments under which military forces now deploy.[42] Uncertainties regarding the availability of civilian contractor personnel complicate a unit's ability to efficiently organize, prepare, plan, and conduct operations. Even though Joint Pub 4-0 clearly states, "The principles of logistics complement the principles of war," the introduction of contractors to the battlefield violates the principles of simplicity, security, and unity of command.[43]

Core Capabilities, Take Two

To better align with the principles of war and protect against an inability to conduct operations, military forces must remain capable of performing the necessary functions and services required to operate and maintain their systems and supplies.[44] This takes us back to Title 10 USC 2464 and reinforces the intent behind its requirement for each Service to maintain a core logistics capability. A DoD report, designed to help develop product support strategies, emphasizes the need for this organic capability: "Organic depot maintenance is used as an effective second source to avoid total reliance on contractor support."[45] It also addresses the advantages of organic support should contractor support fail for whatever reason. "By maintaining the minimum capability necessary to support technical competence, the second source provides a fallback position should the contractor be unable to meet performance criteria."[46] Second source capabilities, especially in light of the risks associated with contractor support during contingency operations, are absolutely essential. For weapon systems, this means developing product support strategies that provide for military support in addition to CLS. Acquisition policy reflects this view:

> It is DoD policy to maintain adequate core depot maintenance capabilities to provide effective and timely response to surge demands, ensure competitive capabilities, and sustain institutional expertise. Support concepts for new and modified systems shall maximize the use of contractor provided, long-term, total life-cycle logistics support that combines depot-level maintenance for *non-core-related* workload along with wholesale and selected retail materiel management functions (Emphasis added).[47]

Although combatant commanders maintain responsibility for ensuring adequate support of fielded systems and personnel, program managers and contracting officers must develop strategies and execute contracts that ensure support is available. This requires education and training of the acquisition work force concerning the benefits and risks associated with contracted support, particularly support that places contractor personnel on the battlefield. As General A.C.P. Wavell once stated, "It takes little skill or imagination to see where you would like your army to be and when; it takes much more knowledge and hard work to know where you can place your forces and whether you can maintain them there."[48]

Future Support

The introduction of contractors to battlefield operations creates challenges for operational and support commanders alike. Dramatic changes in the strategic environment, to include the loss of a major superpower threat in the European theater, has forced significant reductions in US force structure and diminished prepositioned equipment and supplies. The Air Force alone has been cut nearly 40 percent since 1986. These reductions have contributed to the need for additional personnel, particularly in the area of logistics, to support an increased involvement in contingency operations. Overseas support personnel catered to an average of 3,500 Air Force troops in 1989. By 1996, that average rose to 13,700.[49] Since the military no longer has the force structure to meet all its demands, additional support has to come from outside sources—enter the civilian contractor community.

The US civilian work force makes significant contributions to the Services. They go beyond the call of duty to staff defense depots, maintain weapon systems, and supply troops in peacetime operations as well as war. Their dedication is critical to the successful deployment and sustainment of US troops.[50] During Desert Storm:

> Industry executives estimated there were about one thousand contractor personnel at air bases, on aircraft carriers, and at other military facilities throughout the Gulf region. The primary role of these personnel was to assist military technicians in diagnosing and solving problems with weapons systems and in assessing and repairing battle damage. Without significant contributions by government civilians, contractors, and the hundreds and thousands of people working at plants and factories supplying everything from bottled water and desert camouflage uniforms to spare parts for the Abrahms main battle tank, the US' ability to successfully support a major military campaign in the Gulf region would have been jeopardized.[51]

Imagine the workload that would be placed on them today with a military force structure that is only a shadow of what existed in the Persian Gulf crisis.

Requirements for civilian support will be an inevitable part of future military operations. This support and backup plans to ensure continued operations must be determined prior to deployment. Joint Logistic Doctrine states:

> Fully trained and equipped Combat Support and Combat Service Support elements must be available and deployed in adequate number to render immediate sustained support to the combat troops. A combat force without logistic support is immobile and powerless.[52]

Obtaining this support from the civilian sector can enhance combat operations if accomplished smartly. Contractors provide new sources for supplies and services and also act as force multipliers for many functions. Their support also helps bridge the gaps to reach our deployed forces.[53] On the other hand, contracted support can be a deterrent to military operations if not appropriately applied.

Conclusions/Recommendations

> *To a conscientious commander, time is the most vital factor in his planning. By proper foresight and correct preliminary action, he knows he can conserve the most precious elements he controls, the lives of his men. So he thinks ahead as far as he can.*
>
> **General Mathew B. Ridgway**

Contractors will remain an integral part of future military support operations. However, unstable environments associated with operations other than war may quickly turn violent leaving civilian support personnel vulnerable to attack. It is incumbent upon military acquisition program managers, contracting officers, and combatant commanders to understand the ramifications of any decision that may place contractors on the battlefield and to determine the product support, contracting, and employment strategies that minimize the risk of such an occurrence.

Product Support

Acquisition program managers are first in line to address contractor support requirements for new and modified weapon systems. They determine the applicability of competitive sourcing to their particular program and assess product support requirements.[54] Program managers are responsible for addressing support concepts early in the system design process and delivering supportable systems to the warfighter. Alternative support concepts and the associated cost estimates are determined at the program office via supportability analyses. "Supportability analyses shall form the basis for related design requirements included in the system specification and for subsequent decisions concerning how to most cost-effectively support the system over its entire life-cycle."[55] By and large, program managers are held to strict program budgets and are faced with continual reprogramming directives. For this reason, when selecting the *optimum* product support strategy, cost-effectiveness often wins over military effectiveness.

The decision to forego a portion of combat support effectiveness in the interest of saving costs illustrates the difficulty in the decision-making processes inherent to acquisition management. Decreases in functionality and design are frequently traded for reduced costs; however, this is not accomplished blindly. Often, program managers must decide between implementing cost-savings measures and placing the survivability of their program at risk. Acquisition policy instructs program managers to ensure systems can be cost-effectively supported and are "provided to the user with the necessary support infrastructure for achieving the user's peacetime and wartime readiness requirements."[56] This direction coincides with recent guidance for developing product support strategies, which state,

"Any review of product support strategies must first and foremost focus on the requirements of the warfighter. The ultimate results of any product support strategy must be a weapon system that meets or exceeds warfighter requirements at an affordable price."[57] The responsibility for deciding the trade-off between affordability and usability, to include the associated risks, lies with the program manager. It is, therefore, imperative that the program manager closely coordinate an acquisition plan with the using command to ensure system requirements are fully defined and risk factors fully understood. Without this coordination, systems that *fail to meet user requirements* may be developed and deployed leaving the combatant commanders to deal with the support problems.

The task of deciding the appropriate support strategy has become even more difficult with the revolutionary advances in technology and increased focus on joint and dual-use applications. Unfortunately, no *one-size-fits-all* solution exists. "Each weapon system and Service will have their own unique requirements and constraints, all of which must be factored into the decision process necessary to drive an effective product support strategy."[58]

Contract Development

Just as no single strategy meets the program manager's needs, no single contracting vehicle can accommodate all the necessary requirements for every circumstance. Each requirement must be understood and appropriate contracting language applied to ensure a usable product. This responsibility rests with the contracting officer. While joint publications describing strategies for deployment and employment of operational forces abound, joint doctrine for contracting remains underdeveloped. As a result, contracting for support of joint operations is being conducted in a somewhat ad hoc fashion.[59]

Acquisition policy helps clarify some of this confusion. DoD 5000.2-R states commercial sources shall be used "when they are available, cost-effective, and can readily meet the users' requirements."[60] It does not, however, address contracting for civilian support on the battlefield. The Army has developed policy to help contracting officers determine the appropriate course of action in the event they require contractor support in hostile environments. According to FM 100-10-2:

> The following must be considered during the negotiating and drafting of any contract that requires the employment/ deployment of civilian contractors to support US Army operations/weapon systems:
>
> A plan to transition from peacetime operations to operations during conflict, war, and/or MOOTW, and a subsequent plan to transition back to peacetime.
>
> A plan to transition mission accomplishment back to the government if the situation requires the removal of contractors.[61]

This policy implies that a military capability will exist to perform contractor functions in the event they are unable to carry out their mission.

Since the DoD prefers that military personnel perform all product support functions in the area of responsibility, the question may be asked as to why contractors would be hired in the first place. Current DoD reports describing product support strategy development state, "Any function performed where troops are subject to *deploy* to the area of responsibility (AOR) would be *excluded* from performance by a commercial source of support."[62] Just like the program manager, the contracting officer has many conflicting recommendations to take into consideration when contracting for support; however, they must still comply with all applicable laws. Accommodating these sometimes contradictory requirements between the various laws, regulations, and available resources is implicit to contract development and negotiation.[63] "Consequently, the art and science of writing contracts will become extremely critical to ensuring flexibility, sustainability, and survivability on the battlefield."[64]

Employment

Once the program manager has developed a viable support strategy and the contracting officer has executed the contract, responsibility transfers to the combatant commander. Active involvement by the commander during both the strategy development and contracting phases should help minimize the problems encountered with contractor employment. There will be no time to nitpick contract clauses during the conduct of military operations. Command and control of contractor personnel and their deployment conditions are dependent upon the terms and conditions of the contract and the tactical situation.[65] Since the contract determines the extent of the commander's authority, the commander should influence the contacting process early to help operations run more smoothly once deployed. Resolving complex relationships and issues with command authority, force sustainment, and force protection prior to actual deployment will benefit both contractor personnel and the military units. An adjustable strategy, combined with a flexible contract vehicle, will also enhance the commander's ability to deal with the uncertainties inherent to military operations. "Commanders have enough to worry about in fighting a war; they do not need to be concerned about contracting. They need the flexibility to do what is needed, when it is needed, and to the degree it is needed. To have any less flexibility increases risk significantly."[66] The combatant commanders, contracting officers, and program managers must work together to secure contractor support that improves effectiveness, maintains flexibility, and does not negatively impact mission capability. Intelligent contracting decisions require shared knowledge of user requirements, system support concepts, contract laws, and the employment environment.

Recommendations

Cultivating successful outsourcing requires fundamental improvements to DoD training and education programs, to include the incorporation of *contractors on the battlefield*. Increasing the awareness of the complexities involved with placing civilians in hostile environments will allow program managers and contracting officers alike to affect product strategies early on and acquire responsive support. Furthermore, with the dawning of a new century, the Department of Defense must consider the applicability of statutory law with respect to civilian support of the revolution in military affairs, the revolution in business affairs, and a new strategic environment.

Education and Training

Joint Vision 2010 says it best with respect to the need for improved education and training programs to meet the needs of the future:

> It is essential that our Joint Professional Military education (JPME) programs provide our warfighters with an understanding of strategic concepts in the future environment where military force will be applied, as well as an in-depth understanding of individual Service systems and how the integration of these systems enhance joint operations.[67]

Education programs for acquisition program managers cover basic program management concepts and conduct exercises in strategy development and contract negotiation. However, these courses lack information on the appropriate strategies and techniques for employing civilian contractors in support of contingency operations: information most program managers will require in the near future. The Advanced Program Manager's Course, taught at the Defense Systems Management College, covers issues with contractor logistic support, but only as an optional elective. Integrating it into the main stream course material will help all course attendees develop better program and contract strategies for using CLS.

Training for civilian personnel needs to be incorporated in joint exercises. By actively involving contractors, the military can gain better insight into and appreciation for what they bring to the fight. Plus, it provides an excellent opportunity to identify problem areas and modify procedures and/or contracts to correct them before actual deployment. Outsourcing and privatization issues will become increasingly prevalent as the military relies more on commercial services to meet their operational commitments. *Contractor-on-the-battlefield* training for program mangers, contracting officers, and commanders is essential to the military's future. As *Joint Vision 2010* emphasizes, "Our education and training programs must prepare joint warriors to meet the challenges of the future battlespace."[68]

Laws and Regulations

Along with improved training and education, a review of the existing laws and regulations and their applicability to the new strategic environment is required. "While contracting for services is nothing new for the Army, incorporating contracting into doctrine as an essential element of force application is."[69] This statement is true for all the Services. Modifying Title 10 USC to grant UCMJ authority over civilians supporting military operations and MOOTW may increase unity of command and decrease force protection issues. Of course US Code cannot be arbitrarily changed to solve an operational command problem. However, the new strategic environment warrants an investigation of its applicability. Also, if Title 10 requires that each Service maintain a core logistics capability, then Congress must comply with the law and give the military the required personnel and infrastructure to maintain that capability. Examples abound of systems that cannot be operated without contractor support. Joint Surveillance Targeting and Attack Radar System and Rivet Joint aircraft, two vital collection platforms, fit this description. Fortunately, contractor support personnel have willingly ventured out of their safety zones to maintain those systems. That may not always be the case. As two experienced logisticians so aptly put it, "The issue of "Contractors on the Battlefield" is clearly bigger than any functional area, bigger than any Service, and perhaps even bigger than DoD itself."[70]

Experience shows that operational readiness problems do not get resolved by simply replacing a downsized military force with civilian personnel. A one-to-one exchange does not exist. In fact, many new problems are introduced when civilians enter the battle zone. Fighting and winning the nation's wars is the military's job. The Services must be able to train, educate, and equip their forces to effectively carry out that job, no matter who accompanies them on the battlefield.

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notable quotes

Perhaps the most significant lesson of World War II is that the military potential of a nation is directly proportional to the nation's logistic potential. The first hard fact to be faced in applying that lesson is that our resources are limited. The next is that the slightest delay or inefficiency in harnessing our logistic resources may cost us victory.

Major General O.R. Cook, USA

Before any plans can be made to provide an army, logistics must be provided first. History has changed a lot, but logistics has been the crux of every one of these changes; the nail that was missing which lead to the loss of a country lead to a lot of those decisions.

Major General Hugh J. Knerr, USAAF

The first prerequisite for any regular logistics system is, of course, an exact definition of requirements.

Martin van Crevald

The plan of embarking mules and men in the same ships, was in the first instance objected to on the grounds that some ships were better able to carry mules than others, and that the comfort of the troops would be greater if all animals were placed in separate vessels; but this objection was overruled by the Commander-in-Chief, who stated that he was convinced by history, that the governing principle in preparing such expeditions, was so to embark the force that every portion of it should be able to disembark, completely equipped from the ship or ships conveying it. This, he stated was absolutely necessary if the landing was likely to be opposed, and was the best means of preventing confusion and delay even if there was no opposition.

British Egyptian Expedition, 1882

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